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SCIENCE & TECHNOLOGY

SPACE RESEARCH

India's Space Programme Origin and Development

Space activities in India started in the sixties with the establishment of Thumba Equatorial Rocket Launching Station (TERLS). The efforts were consolidating with formation of Indian Space Research Organisation (ISRO) in 1969. The space programme got further fillip in June 1972, when the Government of India constituted the Space Commission and established the Department of Space (DOS). ISRO was brought under newly formed DOS in September 1972.

OBJECTIVES

The primary objective of the Indian Space Programme is to achieve self-reliance in space technology and evolve application programmes to meet national developmental needs.

DEVELOPMENTS

Over the last three decades, the space programme has taken important strides in meeting its objective. Two major operational space systems have been established - the Indian National Satellite (INSAT) for telecommunication, television broadcasting and metrological services and Indian Remote Sensing Satellite (IRS) system for resources monitoring and management.

Two launch vehicle, the Polar Satellite Launch vehicle (PSLV) primarily for launching remote sensing satellites into polar orbits and Geosynchronous Satellite Launch Vehicle (GSLV) for launching communication and metrological satellites into 36000 km high Geosynchronous Transfer Orbit (GTO) have been operationalised. Space application programmes with participation of user agencies have enabled the benefits of space programme to reach the grassroots level of society. Research in space science has contributed towards increased knowledge and understanding of several scientific phenomena. The capabilities built under space programme are used for commercial gains through international marketing of space hardware and services.

A bird's eye view of these developments is given in Table1 (Milestones) and Table 2 (Decade plan) below.

	PSLV-Cl1 successfully launches CHANDRAYAAN-1 from Sriharikota (October 22, 2008).
2008	PSLV-C9 successfully launches CARTOSAT-2A, IMS-1 and 8 foreign nano satellites from Sriharikota (April 28, 2008).
	PSLV-C10 successfully launches TECSAR satellite under a commercial contract with Antrix Corporation (January 21, 2008).
	Successful launch of GSLV (GSLV-F04) with INSAT-4CR on board from SDSC SHAR (September 2, 2007).
	ISRO's Polar Satellite Launch Vehicle, PSLV-C8, successfully launched Italian astronomical satellite, AGILE from Sriharikota (April 23, 2007).
2007	Successful launch of INSAT-4B by Ariane-5 from Kourou French Guyana, (March, 12, 2007).
	Successful recovery of SRE-1 after maneuvering it to re-center the earth's atmosphere and descend over the Bay of Bengal about 140 km east of Sriharikota (January 22, 2007).
	ISRO's Polar Satellite Launch Vehicle, PSLV-C7 successfully launches four satellites - India's CARTOSAT-2 and Space Capsule Recovery Experiment (SRE-1) and Indonesia's LAPAN-TUBSAT and Argentina's PEHUENSAT-1 (January 10, 2007).
2006	Second operational flight of GSLV (GSLV-F02) from SDSC SHAR with INSAT-4C on board. (July 10, 2006). Satellite could not be placed in orbit.
2005	Successfu1 launch of INSAT-4A by Ariane from Kourou French Guyana, (December 22, 2005).

	ISRO's Polar Satellite Launch Vehicle PSLV-C6 successfully launched 'CARTOSAT-1 and HAMSAT satellites from Sriharikota (May 5, 2005).
2004	The first operational flight of GSLV (GSLV-F01) successfully launched EDUSAT from SDHC SHAR, Sriharikota (October 17, 2003).
2003	ISRO's Polar Satellite Launch Vehicle, PSLV-C5, successfully launched RESOURCESAT-1 (IRS-P6 satellite from Sriharikota (October 17, 2003). Successful launch of INSAT-3E by Ariane from Kourou French Guyana, (September 28, 2003). The second developmental launch of GSLV-D2 with GSAT-2 on board from Sriharikota (May 8, 2003). Successful launch of INSAT-3A by Ariane from Kourous French Guyana, (April 2003).
2002	ISRO's Polar Satellite Launch Vehicle, PSLV-C4, successfully launched KALPANA-1 satellite from Sriharikota (September 12, 2002). Successful launch of INSAT -3C by Ariane from Kourou French Guyana, (January 24, 2002).
2001	ISRO's Polar Satellite Launch Vehicle, PSLV-C3, successfully launched three satellites - Technology Experiment Satellite (TES) of ISRO, BIRD of Germany and PROBA of Belgium - into their intended orbits (October 22, 2001). The first developmental launch of GSLV-D1 with GSAT-1 on board from Sriharikota (April 18, 2001).

Table - 2

Major Indian Space Missions 2001-2008

2004-2004	2001-2005-2002	2006-2002-2003	2003-2005	2007-2008
IRS RESOUR	TES CARTO	CARTO		
OCEAN SAT-1	SAT-1	SAT-2	CE SAT-2	RISAT-1
INSAT	3C 4A 4B	4C 4D	3A 3E 43	
METSAT		KALPANA-1		INSAT-3D
Experimental EDUSAT				
Technical 2 4 Payloads	GSAT-1 GSAT	SRE-1	GSAT-GSAT-	
HAMSAT			MK-II	
SPACE SCIENCE				CHANDRYAN ASTROSAT
PSLV C6	C3 C7	C4 C8	C9 C5 C10 C11	
GSLV F1 Mk I and II	D1	F2 D3 F3	F4 D2 F5	
GLSV-MK III			D1	

Ques. 1 : Briefly discuss the main features of the Indian National Satellite System?

Ans. The Indian National Satellite (INSAT) system is one of the largest domestic communication satellite systems in the Asia-Pacific region. In the 1980s, it initiated a major revolution in India's communications sector and sustained the same later.

The satellites of INSAT system, which are in service today, are INSAT-2E, INSAT-3A, INSAT-3B, INSAT-3C, INSAT-3E, KALPANA-1, GSAT-2, EDUSAT and INSAT-4A that was launched recently. The system provides a total of about 175 transponders in the C, Extended C and Ku-bands. Being a multipurpose satellite system, INSAT provides services t~o telecommunications, television broadcasting, weather forecasting, disaster warning and Search and Rescue fields. The INSAT system serves many

important sectors of the Indian economy. Foremost amongst them is Telecommunications sector wherein INSAT is providing Mobile Satellite Service besides providing VSAT services. Today, more than 25,000 Very Small Aperture Terminals (VSATs) are in operation.

Similarly, Television broadcasting and redistribution have been immensely benefited by INSAT. Thanks to INSAT, more than 900 million people in India have access to TV through about 1400 terrestrial rebroadcast transmitters. In addition to this, social development through exclusive channels for training and developmental education has become possible through INSAT. And, a Telemedicine network to take super speciality medical services to the remote and rural population has become a reality. The network now covers 152 hospitals-120 remote rural hospitals and 32 super speciality hospitals in major cities. The launch of EDUSAT, India's first thematic satellite dedicated exclusively for educational services, has provided further fillip to the educational services offered by the INSAT system INSAT system is also providing meteorological services through Very High Resolution Radiometer (VHRR) and CCD cameras on some of its spacecraft. This apart, cyclone monitoring through meteorological imaging and issue of warnings on impending cyclones through disaster warning receivers have been operationalised. For this, 350 receivers have been installed along the east and west coasts of India.

Indian National Satellite System (INSAT) (Since 2001)

1.	GSAT-1	April 2001	Experimental Satellite for the first development flight of Geo-synchronous Sate-llite Launch Vehicle, GSLV-D1.
2.	INSAT-3C	January	To augment the existing INSAT capacity for communication and broad-casting-besides providing continuity of the services of INSAT-2C.
3.	KALPANA -1	September 2002	METSAT was the first exclusive mateorological satellite built by ISRO named after Kalpana Chawla.
4.	INSAT-3A	April 2003	Multipurpose Satellite for communication and broadcasting, besides providing meteorological services along with INSAT2E and KALPANA-1.
5.	GSAT-2	May 2003	Experiemental Satellite for the second development test flight of India's Geosyn-chronous Satellite Launch Vehicle, GSLV.
6.	INSAT-3E	September 2003	Exclusive communication satellite to augment the existing INSAT System.
7.	EDUSAT	September 2004	India's first exclusive educational satellite.
8.	HAMSAT	May 2005	Microsatellite for providing satellite based Amateur Radio Services to the national as well as the international community (HAMs).
9.	INSAT-4A	December 2005	The most advanced satellite for Direct-to-Home television broadcasting services.
10.	INSAT-4C	July 2006	State-of-the-art communication satellite - could not be placed in orbit.
11.	INSAT-4B	March	An identical satellite to INSAT capacity for Direct-To-Home (DTH) television services and other communi-cations.
12.	INSAT-4CR	September 2007	Designed to provide Direct-To-Home (DTH) television services, Video Picture Tranmission (VPT) and Digital Satellite News Gathe-ring (DSNG), identical to INSAT-4C.

Ques. 2 : Discuss in brief the Indian Remote Sensing Satellite System and its importance?

Ans. India has the largest constellation of Remote Sensing Satellites, which are providing services both at the national and global levels. From the Indian Remote Sensing (IRS) Satellites, data is available in a variety of spatial resolutions starting from 360 metres and highest resolution being 2.5 metres. Besides, the state-of-the-art cameras of IRS spacecraft take the pictures of the Earth in several spectral bands. In future, ISRO intends to launch IRS spacecraft with better spatial resolution and capable of imaging day and night. The satellites of IRS system which are in service today are IRS-1C, IRS-ID, IRS-P3, OCEANSAT-1, Technology Experimental Satellite (TES). RESOURCESAT-1, and the recently launched CARTOSAT-1 capable of taking stereo pictures. The upcoming Remote Sensing Satellite are Cartosat-2, RISAT (Radar Imaging Satellite) and Oceansat-2.

Imagery sent by IRS spacecraft is being put to a variety of uses in India with agricultural crop acreage and yield estimation being one of the most important uses. Besides, such imagery is being used for ground

and surface water harvesting, monitoring of reservoirs and irrigation command areas to optimise water use. Forest survey and management and wasteland identification and recovery are other allied uses. This apart, IRS imagery is also used for mineral prospecting and forecasting of potential fishing zones.

With regard to applications in planning and management, IRS data is being used for urban planning, flood prone area identification and the consequent suggestions for mitigation measure. Based on this experience, the concept of Integrated Mission for Sustainable Development has been evolved wherein the spacecraft image data is integrated with the socio-economic data obtained from conventional sources to achieve sustainable development.

Indian Remote Sensing Satellite (IRS) (Since 2001)

1.	Technology Experiment Satellite (TES)	October 2001	Technology Experiment Satellite Launched by PSLV-C3.
2.	IRS-P6 Resourcesat-1	October 2003	Launched by PSLV-C5, carries three camera, names, LISS-4, LISS-3 and AwiFS
3.	CARTOSAT-1	May 2005	Launched by PSLV-C5, two panchromatic cameras - PAN (fore) and PAN (aft) - with 2.5 meter resolution. The cam mounted with a tilt of +26 deg and -5 deg along the track to provide stereo images.
4.	CARTOSAT-2	January 2007	Launched by PSLV-C7, it is an advanced remote sensing satellite carrying a panchro-matic camera capable of providing scene specific scene specific spot imageries.
5.	SRE-1	January 2007	Launched by PSLV-C7, Space capsule Recovery Experiment (SRE-1), intended to demons-trate the technology of an plat-form for performing experi-ments in microgravity condi-tions. SRE-1 was recovered successfully after 12 days over Bay of Bengal.
6.	CARTOSAT-2A	April 2008	Identical to CARTOSAT-2, launched by PSLV-C9.
7.	IMS-1	April 2008	Launched by PSLV-C9, along with CARTOSAT-2A and other Eight Nanosatellites.

Ques. 3 : Give an account of the Satellite Launch Vehicles Programme of India?

Ans. After successfully testing the first indigenous launch vehicle SLV-3 in 1980, ISRO built the next generation Augmented Satellite Launch Vehicle (ASLV). ISRO's Launch Vehicle Programme had a giant leap with the successful launch of IRS-P2 spacecraft onboard the Polar Satellite Launch Vehicle (PSLV) in October 1994. On 18 April 2001, India successfully launched its Geosynchronous Satellite Launch Vehicle (GSLV) Technology development for advanced launch vehicles made good progress with the breakthrough achieved during the year in Supersonic Combustion Ramjet (SCRAMJET) to be employed in Air-Breathing engine. This is an important element in the launch vehicle technology development. Concepts for reusable launch vehicle are also being studied.

Ques. 4 : What P.S.L.V.? Discuss its performance in the Indian Space Programme?

Ans. The four stages PSLV is capable of launching upto 1,600 kg satellites into an 620 km polar orbit. It has provision to launch payloads from 100 kg micro-satellites or mini or small satellites in different combinations. It can also launch one ton class payloads into Geosynchronous Transfer Orbit (GTO). So far, it has performed twenty missions with nineteenth consecutive successes. Latest success of PSLV:

- PSLV-C 19 has successfully placed the RISAT-1 (Radar Imaging Satellite) of 1858 Kg in the 480 Km Polar orbit on 26 April, 2012.
- On 12 October, 2011 PSLV-V 18 placed Megha - Tropiques, SRMSAT, Jugnu, VESALSAT Sattellites.
- On 15 July, 2011 PSLV-C 17 placed GSAT-12 (Communication Satellite) in Geo-stationary orbit of 36,000 Km.

Ques. 5 : Give an account of the G.S.L.V.?

Ans. The GSLV was successful on its very first test flight. After its successful second flight in May 2003, it was commissioned. This was followed by the success of its third flight in September 2004. The GSLV is capable of launching 2,000 kg class satellites into Geosynchronous Transfer Orbit (GTO). The development of Indigenous cryogenic stage to be used as the third stage of GSLV made further progress. The cryogenic engine which forms part of this stage, has already been successfully qualified. GSLV-Mk-III, a new version of GSLV and capable of launching

spacecraft weighing upto 4 tonnes to GTO is under development.

Ü *Infrastructure*

As noted earlier, the Space Commission is the nodal agency for co-ordinating R&D activities in space science and technology with Department of Space being its executive wing and ISRO its chief operational arm. Thus ISRO is the apex organisation that plans, programmes, manages and controls all R&D activities in space science and technology as well as application of the same in various fields. There are many space centres through which ISRO carries out its tasks.

Ques. 6 : Comment on the following in not more than 50-word each:

i) VSSC	**(ii) ISAC**	**(iii) SAC**
iv) SHAR Centre	**v) IISU**	**vi) LPSC**
vii) NNRMS	**viii) NRSA**	
ix) ISRo Telemetey	**x) DECU**	
xi) MCF	**xii) RRSSCs**	

Ans.

i) Vikram Sarabhai Space Centre (VSSC) -located at Thumba, Thiruvananthapuram, this is the national centre providing technology base for the country's indigenous satellite launch vehicle development efforts. It is the largest of ISRO centres with the main task of rocket research and planning and execution of satellite launch vehicles like SLV, ASLV, PSLV and GSLV.

ii) ISRO Satellite Centre (ISAC) - located at Bangalore, this centre is responsible for the design, fabrication, testing and management of application satellites. Over the years, this centre has successfully designed and fabricated satellites like Aryabhatta, Bhaskara, Apple and the IRS and INSAT series of satellites.

iii) Space Application Centre (SAC) - located at Ahmedabad, this is ISRO's R&D Centre for conceiving, organising and building systems for practical application of space technology. It works towards finding beneficial applications of space technology in the Indian context and operationalising them. The major activities include satellite based communication, meteorology, remote sensing, environmental monitoring etc.

iv) SHAR Centre (Sriharikota High Altitude Range), Sriharikota (A.P.) - It is the main launch centre of ISRO. Starting from the launch of the first ever sounding rocket 'ROHINI' this centre has supported the launches of SLV, ASLV, PSLV and GSLV. At the centre, a second launch pad has been constructed to augment and improve the existing launching facilities. With the improvement, it was able to launch the most advanced launch vehicle such as GSLV-D1, in April 2001. The facilities at the centre now include launch pad with jet deflector, vehicle assembly building (high bay), propellant and gas storage and transfer facilities for earth storable and cryo propellants, safety systems and instrumentation and control systems of automatic filling of propellants, It has been renamed as Satish Dhawan Space Centre (SDSC).

v) ISRO Inertial Systems Unit (IISU) - Located at Thiruvananthapuram, it is responsible for carrying out R&D towards inertial sensors and systems and allied satellite elements for various missions. Its task is to ensure that the needs of ISRO launch vehicles and satellite programmes, in terms of systems like gyroscopes, reactions wheels etc., are met. It developed the navigation system for the PSLV.

vi) Liquid Propulsion Systems Centre (LPSC)- It is responsible for R&D in liquid propulsion, earth storable and cryogenic engines; stages and associated components for launch vehicles and spacecrafts. It is located on three campuses at Mahendragiri in Tamil Nadu (with large solid booster preparation and testing facility), Valiamala in Kerala (with facility for integration, checkout, structural testing, separation and jettisoning systems testing and control component development) and Bangalore in Karnataka.

vii) ISRO Telemetry, Tracking and

Command Network (ISTRAC) - This centre provides telemetry, tracking and common support for the launch vehicles and satellite missions. Its headquarters and spacecraft control centre is at Bangalore and it also has a network of ground stations at Sriharikota, Thiruvananthapuram, Bangalore, Lucknow, Car Nicobar and Mauritius. It successfully provided the telemetry tracking and command support to PSLV missions.

viii) National Natural Resources Management System (NNRMS) - Under the administrative control of Department of Space, this facility has active participation of many state and central government departments and agencies. The availability of data from various satellites under the IRS programme has enabled taking up a number of nation wide remote sensing application projects relating to: natural resource management e.g. regular monitoring and estimation of crop acreage, yield etc. of various crops, monitoring of forest resources etc.

ix) National Remote Sensing Agency (NRSA)- Like NNRMS, it is another autonomous body under the administration of DOS. It is responsible for acquisition, processing and dissemination of satellite and aerial remote sensing data, training of user scientists in various applications in different disciplines for resource mapping, disaster monitoring etc. Located at Hyderabad, it also runs the Indian Institute of Remote Sensing at Dehradun.

x) Development and Educational Communication Unit (DECU)- Located at Ahmedabad, it is involved in the conception, definition, planning and socio-economic education of space application programmes. Besides carrying out R&D with themes of development and education oriented communications. It also provides training services in those areas.

xi) Master Control Facility (MCF)- located at Hassan, Karnataka, its a multi-mission control centre charged with the responsibility of control and operation of INSAT and GSAT group satellites in orbit. This is done through its network antennae, earth stations, computers and control facilities. All the post launch operation of these satellite including orbital manoeuvres, station keeping, in orbit operation, payload testing and initial orbit raising of the spacecraft are monitored and controlled by MCF. It is an integrated facility consisting of Four Satellite Control Earth Stations supporting continuous monitoring of Search Rescue Signals, VHRR and OCP downlinks. The spacecraft control centre at the MCF is the nerve centre of the entire spacecraft operations.

xii) Regional Remote Sensing Service Centres (RRSSCs) - The five operational RRSSCs at Bangalore, Dehradun, Jodhpur, Kharagpur and Nagpur are engaged in the execution of various national level projects, user projects, application validation projects and technology and software development projects.

Ü *Launch Infrastructure*

An elaborate launch infrastructure exists at the Satish Dhawan Space Centre (SDSC) SHAR, Sriharikota Island on the East Coast of India which is about 100 km from Chennai. Sriharikota is located at 13° North latitude. From here, satellites can be launched into a variety of orbital inclinations starting from 18° and extending upto 99° Full-fledged facilities for satellite integration, assembly and launch exist there. Sriharikota also houses a Telemetry, Tracking and Command network for tracking satellites and monitoring them. The newly built Second Launch Pad at SPSC SHAR as a redundancy to the existing launch pad, and to cater to the requirement of GSLV-Mk III as well as other future launch vehicles, was commissioned in May 2005 with the successful launch of PSLV-C6.

Ques. 7 : What is Cartosat-1?

Ans.

CartoSat-1

The satellite primarily intended for advanced Mapping applications. It was launched in May 2005.

Payload: Two panchromatic cameras with a spatial resolution of 2.5 meter and a swath of 30 km each.

New Technologies Used: in proved version of Star sensor, bus interface connecting control system, satellite positioning system and data handling.

Ques. 8 : What is Cartosat-2?

Ans. : It is advanced remote sensing satellite with single panchromatic camera capable of providing scene-specific spot imageries of cartographic applications. The camera with one-meter spatial resolution and swath of 10 km.

New Technologies: Two mirror on single axis camera, Carbon Fabric reinforced Plastic based electro optic structure, advanced solid state recorder, high torque reaction wheels, lightweight, large size mirrors. It was launched in 2007.

Ques. 9 : What is Radar Imaging Satellite (RISAT)?

Ans. RISAT with night and day imaging capability as well as imaging under cloudy conditions will be important system to complement band of electro-optical sensors on board IRS System.

IRSAT will have multi-mode, multi-polarisation, agile synthetic Aperature Radar (SAR) operating in C-band and providing 3.50 meters spatial resolution. It will incorporate algorithms and data products to serve the user community.

Ques. 10 : What is OCEANSAT-2?

Ans. It is envisaged for providing continuity to ocean sat-1. It will carry OCM and a Ku-band Pencil Beam scatterometer, 8-band multi-spectral camera. The scatterometer is a microwave radar for measuring ocean surface wind velocity. It will be launched in PSS orbit of 720 km altitude by PSLV.

Ques. 11 : What is TWSAT?

Ans. The 90-kg TWSAT is a remote sensing micro-satellite proposed for third world countries. The payload will be a 2-band CCD Camera with single optics and beam splitter. The 50 user terminals, which can receive payload data are to be installed in Indian Universities and selected Third World Countries.

Ü *Scientific Missions*

India has a vibrant space science programme covering astronomy, astrophysics, planetary and earth sciences. There activities are mainly carried out at Physical Research Laboratory (PRL), Ahemdabad, Space Physics Laboratory (SPL), Trivandrum, ISRO Satellite Centre, Bangalore. DOS has set up ground based facilities like Udaipur Solar observatory, Mesosphere-Stratosphere- Troposphere. Radar etc. Balloons, Sounding rockets. DOS also participates in international scientific campaigns like MONEX, IGBP, STEP and INDOEX.

Ques. 12 : Discuss in brief the main objectives of the Mission CHANDRAYAN-1?

Ans. It is India's first scientific mission to Moon, to be undertaken during 2007- 2008. The Mission is aimed at expanding the scientific knowledge about the Mass, upgrading India's technological capability and providing challenging opportunities for planetary research to the younger generation.

Scientific Objectives

1. High resolution remote sensing of the, moon in the visible, near infrared, low energy x--ray and high-energy x-ray regions for preparing 3-D atlas of regions of scientific interest.
2. Chemical mapping of entire lunar surface for elements such as Magnesium, Aluminium, Iron, Titanium, and Uranium. PSLV has launched the spacecraft into GTO.

Pay Loads

1. Terrain Mapping Camera with stereo imaging facility with panchromatic band with 5 m spatial resolution and 20 km swath.
2. Hyper-spectral imager with spectral resolution of 15 nm.
3. Lunar Ranging Instrument with vertical resolution of 5 m.
4. Low energy x-ray spectrometer.
5. High energy x-ray spectrometer.

Scientific Instruments Short-listed to Flown on Chandryan-1

Instrument	Country	Purpose
Low Energy	Rutheford	Measure elements

Spectrometer	Lab, UK	of abundance of AI, Si, Ti, Fe.
Near IR Spectrometer	Max Plank Institution Germany	Detect Lunar mineral abundance
Radiation dose monitor experiment	Bulgarian Academy of Sciences	Radiation dose map around the mass
Miniature Synthetic Aperture Radar Instrument	USA, John Hopkins University	Map Polar, Landscape and water deposits.

Ques. 13 : What is ASTROSAT?

Ans. It is national project involving several academic institutions in the country, which will enable multi-wave length studies of variety of celestial sources and phenomena using x-ray astronomy instruments and ultra-violet imaging telescope.

During the year the development of scientific payloads has made considerable progress at "Tata Institute of Fundamental Research" (TIFR), and Indian Institute of Astrophysics and ISRO Satellite Centre.

Ques. 14 : Give an account of the Megha Tropiques?

Ans. Indian region being convectively very active in relation to Monsoon Dynamics, it is necessary to understand the life cycle of these convective systems and to understand their role in the associated energy and moisture budget.

Megha-Tropiques (Megha meaning cloud in Sanskrit and Tropiques meaning tropics in French) is envisaged for investigating the contribution of water cycle in the tropical atmosphere to climate dynamics.

ISRO and French National Space Centre (CNES) had signed a statement of intent in November 1999 for this mission. The satellite will carry three scientific instruments:

1. Multi-frequency Microwave Scanning Radiometer to be developed by "ISRO" and CNES providing information about rain above the oceans, water vapour content in atmosphere, liquid water in clouds.
2. Multi-channel microwave instru-ments to be developed by CNES for providing vertical humidity.
3. Multi-channel Instrument (SCARAB) for providing earth's radiation and budget.

ISRO will build the Megha-Tropiques Spacecraft and launch it using PSLV into 867 km high orbit at an inclination of 20° with respect to the equatorial plane. ISRO will control the satellite in orbit and also receive, process and distribute the scientific data.

Ques. 15 : Briefly discuss the ISRO's Geosphere - Biosphere Programme?

Ans. Under ISRO-GBP scientific projects related to climate change in three mainstreams are carried out. They are

1. Climate change, modelling and paleoclimate.
2. Atomspheric chemistry, Trace Gases and Aerosols.
3. Biogeocycles.

Presently 88 scientific projects are in progress. The simulation of regional climate model, using high-resolution land cover information has revealed significant information on the regional climate scenarios.

SOME PROJECTS

1. Long Mobile Land Aerosop Campaign covering 15,000 km length across South India.
2. Land Aerosol Campaign in North India.
3. Land cover dynamics project in Godavari, Pennar, Sone Rivers.
4. Carbon-dynamics project in Arunachal Pradesh.

Ques. 16 : What is Satellite Navigation Systems (SNS)?

Ans. Satellite Navigation System use radio time signals transmitted by satellites to enable mobile receivers on the ground to determine their exact locations. The relatively clear line of light between the satellites and receivers on the ground, combined with ever-improving electronics, allows SNS to measure location to accuracies on the order of a few metres in real time.

Military Use: The original motivation for satellite navigation was for military applications are:

(1) It allows for hitherto impossible precision in delivery of weapons to targets, greatly increasing their lethality

reducing inadvertent causalities (Smart Bombs).

(2) It also allow forces to be directed and to locate themselves more easily.

(3) It is a force multiplier. In particular, the ability to reduce unintended causalities has particular advantages for wars being fought by democracies, where public relations is an important aspect of welfare.

CIVILIAN USES

(1) Navigation: ranging from personal hand-held devices for tracking, to devices fitted to cars, trucks, ships and aircrafts.

(2) Vehicle Traffic System: The system monitors traffic loads for every needs and accordingly- necessary diversions.

(3) Remote Sensing: Surveying, entering data into geographical information systems.

(4) Search and Rescue

(5) Geophysical Sciences.

(6) Animal Tracking System

Ques. 17 : What is Global Positioning System?

Ans. GPS (Global Positioning System) : The best known satellite navigation system is the United States GPS and as of 2005, the GPS is the only fully functional Satellite System. It consists of 24 of 27 satellites that orbit in six different planes. The exact numbers of satellites are replenished when older ones are retired. They orbit at an altitude of approximately; 20,000 km with an inclination of 55°. The satellites are tracked by a world-wide network of monitor stations. The tracking data is sent to master control station that continuously updates position and clock estimates for each satellite. The updated data is then uplinked to the satellite via one of several ground patterns. The accuracy of GPS signal itself is about 5 metres (16 ft) as of 2005. The GPS System was designed by and controlled by the United States Department of Defence and can be used by anyone free of charge.

Ques. 18 : What is GLONASS?

Ans. GlONASS (Global Navigation Satellite System) : The radio satellite navigation system the Russian counterpart to the United States GPS and Europe's Galileo. It is operated for Russian Government by Russian Space Forces.

Like GPS, the complete nominal GLONASS consists of 24 satellites. 21 operating and three on-orbit 'spares' placed in three orbital planes. GLOSNASS constellation orbits the Earth at an altitude of 19,100 km. Slightly lower than GPS.

The first three test satellites were placed in orbit in October 1982. The system was announced operational on September 1993, but constellation was completed by December 1995.

Due to the economic situation in Russia there were only 8 satellites in operation in April 2002, rendering it almost useless as a navigation aid. Since the economic situation in Russia has improved, 11 satellites were in operation by March 2004. An advanced GLOSSNASS satellite GLOSSNASS-M, with an operational lifetime of 7 years, has been developed. A 3-satellite block was launched in December 2004.

A further improved GLOSSNASS-K with reduced weight and increased operational lifetime of 10-12 years.

INDIAN PARTICIPATION

Following joint venture deal with India, which will launch two GLONASS-M satellites on its GSLV rockets.

During December 2005 Summit between India and Russia it was agreed that India would share the development costs of the GLOSNASS-K series and launch them from India.

Ques. 19 : What is GALILEO?

Ans. Galileo : It is satellite Navigation System, a joint initiative of European Commission and European-Space Agency (ESA) agreed on March 2002, to introduce their own alternative to GPS. At a cost of about $ 2.5 billion, the required satellites will be launched between 2006 and 2008, and system will be working, under civilian control from 2008. The first satellite was launched on December 28th 2005; the Galileo is expected to be compatible with next generation GPS System that will be operational by 2012.

The receivers will able to combine signals from 30 Galileo and 28 GPS Satellites.

The Galileo 30 new satellites in Medium Earth Orbit will be placed at an altitude of 23,222 km.

WHY GALILEO FOR EUROPE?

The conclusion to build one's navigation system was taken in similar spirit to decision in 1970's to embark upon well-known. European endeavors of Arian Launcher and Airbus.

European Independence is a chief reason for taking this step. Other subsidiary reasons include.

i) By being inter-operable with GPS, and GLONASS, Galileo will be corner- stone of Global Navigation Satellite System (GNSS). This will almost cover most places on Earth.

ii) With Galileo, Europe will be able to exploit the opportunities provided by satellite navigation to extent.

Ques. 20 : What is EGNOS?

Ans. EGNOS : As a precursor to Galileo, the ESA, EU and EUROCONTROL, and developing the European Geo-stationary Navigation Overlay System (EGNOS). This is intended to supplement the GPS and GLONASS Systems by reporting on reliability and accuracy of signals, allowing position to be determined to within 5 metres. It will consist of 3 Geostationary Satellites and a network of grand stations and went operational in 2004.

Ques. 21 : What is BEIDOU?

Ans. Beidou : China has started to launch a series of satellites to form a system called Beidou Navigation System.

Ques. 22 : What is SCRAMJET technology? What are its advantages and limitations?

Ans. Air-breathing Rockets : ISRO tested the scramjet (Supersonic Combustion Ramjet) technology that uses air moving at supersonic speed of March 6 for ignition in Laboratory Condition in January 2006. Conventionally, rockets carry oxygen and fuel and do not depend on oxygen present in the atmosphere to burn the fuel. This is because rockets unlike fighter plane fitted with turbojets which this technology move at very high speed and using oxygen at such high speed is challenging task.

The achievement of producing stable combustion at a high velocity for few seconds is like lighting a matchstick in a hurricane condition. To be more precise, the achievement is not just lighting a matchstick in a hurricane condition but also sustaining the flame for more duration of operation.

ISRO's achievement was in a Laboratory environment. The air velocity was stimulated to reach March 6 at entry conditions and combustion produced by supplying hydrogen fuel.

ADVANTAGES OF SCRAMJET TECHNOLOGY

1. Greater Thrust Achieved: The rockets using liquid fuel will have specific impulse of 300 seconds (thrust generated by burning 1 kg of propellant in 1 second).

Cryogenic fuel will have 440-450 seconds compared with 2500-3000 seconds with scramjet. So compared with Cryogenic, Scramjet Propulsion has significant advantage in enhancing payload capability with cost advantage.

2. Increase in Payload Capacity

Greater the thrust achieved, the lesser the propellant that needs to be carried. Oxygen accounts for nearly 60% of the propellant's weight in a rocket. As scramjet powered rocket utilizes oxygen available in the atmosphere can thus reduce the amount of oxygen to be carried on board considerably. Thus rocket would become lighter or can carry more payloads.

3. There is substantial cost reduction, as less propellant is used for per kg. of payload carried.

But for all its advantages, air-breathing rockets have to still use conventional fuels to reach an acceleration of March 6 before scramjet technology can take over.

LIMITATIONS OF SCRAMJET TECHNOLOGY

1. Oxygen Availability: The scramjet technology can be best used at height 10-12 km region, where oxygen is dense. It cannot perform well after crossing the denser region of atmosphere beyond 40-45 km where oxygen concentration decreases.

2. Trajectory Change: The use of scramjet necessitate a more horizontal trajectory. The trajecto-

ries are designed to allow the rockets to be in atmosphere for longer periods. These longer horizontal trajectories in atmosphere give rise to thermal problems, as temperature of 2200-2800 kelvin is produced when rocket is in atmosphere at higher velocities for longer periods.

Using Scramjet technology is step towards more important reusable Launch Vehicles. It will take .around 7-8 years before scramjet technology is used in launch vehicles.

Ques. 23 : What is Space Capsule Recovery Expriment (SRE)?

Ans. Space Capsule Recovery Experiment (SRE) : SRE is intended for demonstrating the capability to recover an orbiting space capsule. The experiment envisages the development of a 500 kg recoverable capsule and the associated technologies. SRE is intended to test reusable thermal protection system, navigation, guidance and control, hypersonic aero- thermodynamics, management of communication blackout, floatation system, recovery operations.

After its launch by PSLV, SRE will remain in orbit for few days during which it will be used to perform experiments in micro-gravity environment. The capsule will then be de-orbited and it re-enters the earth's atmosphere. On re-entry after initial braking, a parachute system will reduce the touch down velocity. SRE will splashdown in the Bay of Bengal about 140 km east of Sriharikota. A floatation system will keep SRE afloat and enable its recovery.

Ques. 24 : Briefly discuss the importance and future prospects of 'ANTRIX'?

Ans. Antrix, the commercial arm of ISRO, is a single window agency for marketing Indian Space Capabilities. It is playing a key role in the world-wide availability of IRS data through Space Imaging, USA. Antrix also provides IRS specific processing equipments.

It offers launch services using India's PSLV, Two German, One Korean and Belgium Satellite have already been successfully launched by PSL V. Through Antrix, Telemetry, Tracking and Command Support from Indian ground stations are offered. In this regard, 11 transponders have already been leased to Intelsat, US based multinational consortium. The deal will fetch US $ 100 million over a period of ten years. Customers for the spacecraft components offered by Antrix include world's leading spacecraft manufacturers. Antrix has signed a commercial agreement with EOSAT of USA and entered In a MOU with Paris based Asian Space.

Antrix has access to the resource of DOS and ISOR, after having made modest entry into billion dollar global space market, it has now emerged as a major supplier of high quality satellite resource data. Currently, data from India's highly successful IRS series of earth observation spacecraft accounts for one-fourth of world-wide market for satellite resource data.

The biggest asset of Antrix is 10,000 highly skilled technical manpower in various facilities of ISRO, which has over the past three decades built up a wide spectrum of technological capabilities.

The current thrust of Antrix is on penetrating the global market for supplying custom made satellites, which is a difficult but challenging and high profit area.

Ques. 25 : What are future challenges for next generation space technologies?

Ans.

1. Tapping of solar energy from space for terrestrial use.
2. Recoverable spacecrafts
3. The prospects of space tourism could be explored
4. The exploration of newly celestial bodies like moon and mars so that they can be made habitable for humans.

NASA: Milestones and Discoveries

NASA's Next Generation Spacecraft

It announced for its next generation spacecraft and launch system, which will be capable of delivering crew and supplies to ISS, carrying four astronauts to the mans and supporting up to six crew members on future mission to Mars.

Deep Impact Encounters Comet

The Deep Impact Spacecraft travelled approximately 268 million miles to meet comet Tempel-1. Its impact or colludeal with target nucleus, giving research-

ers, the best-ever comet data and images.

Mars Twins keep on Roving

The Mars exploration rovers continued studying the harsh Martian environment. The rover spirit discovered the composition of rock outcrops altered by water.

The rover opportunity found evidence that water, once flowed across the Martian surface.

Ques. 26 : Given an account of the ISRO's international cooperation in the space technology?

Ans. International Cooperation : From the days of its inception, ISRO has had a very good record of international cooperation. It has Memoranda of Understanding/Agreements with 26 countries/space agencies. A UN sponsored Centre for Space Science and Technology Education in Asia and the Pacific (CSSTE-AP) set up in India has trained more than 400 personnel of the Asia-pacific region. During the year, CSSTE-AP completed 10 years. In addition, ISRO provides training in space applications to personnel of developing countries through its Sharing of Experience in Space (SHARES) programme.

ISRO has launched scientific payloads of other space agencies like Modular Opto-electronic Scanner of DLR, Germany that was flown on IRS-P3 spacecraft and the data is being shared by scientists of DLR, India and the US. It has a cooperative agreement with NASAOAA for the reception of meteorological data from INSAT spacecraft by those agencies.

Megha-Tropiques is a joint satellite mission of ISRO and French Space Agency CNES for atmospheric studies. The satellite will be built and launched by ISRO and CNES will develop two of the payloads and the third payload jointly with ISRO. At the same time, scientific instruments developed in the United States, Germany, Sweden, UK and Bulgaria were launched on board India's Chadrayaan-1 spacecraft. This apart, an Italian scientific instrument will be included onboard India's OCEANSAT-2 satellite. Instruments for astronomical observation jointly developed with Israel and Canada will be flown onboard India's GSAT-4 and RISAT satellites respectively. And, an Indian scientific instrument to study solar physics and solar-terrestrial sciences will be flown onboard Russia's CORONAS-PHOTON satellite.

India has also set up three local User Terminals and a Mission Control Centre for the international COSPAS / SARSAT programme for providing distress alert and position location service. A search and Rescue Transponder is included in INSAT -3A spacecraft. India is a signatory to the International Charter on Disaster Management and is providing remote sensing data for the same.

SUPER CONDUCTIVITY

Ques. 1 : What is superconductivity?

Ans. Superconductivity is a phenomenon occurring in certain materials at low temperatures characterised by complete absence of electrical resistance and the exclusion of the interior magnetic field (the Meissner effect).

Superconductivity occurs in a wide variety of materials including simple elements like tin and aluminium, various metallic alloys, some heavy-doped semiconductors and certain ceramic compounds containing planes of copper and oxygen atoms. The latter class of compounds, known as cuprates are also known as high temperature superconductors (HTs). Superconductivity does not occur in noble metals like gold and silver nor in most ferromagnetic metals, although a number of materials displaying both superconductivity and ferromagnetism have been discovered in recent years.

In 1911, Kammerlingh Ones discovered that a certain temperature, and often within a narrow temperature range, the electrical resistivity of many metals and alloys drops suddenly to zero. Ones observed that resistance of mercury vanishes suddenly at 4.2 k. Conventional superconductors exhibit superconductivity at relatively lower temperatures. Unconventional superconductors in particular the high-temperature superconductors (HTs) superconductor at much higher temperatures (though still far below room temperature).

Ques. 2 : Discuss in brief the properties of superconductors?

Ans. Most of the physical properties of super-

conductors vary from material to material, such as the heat capacity and the critical temperature at which - superconductivity is destroyed. On the other hand, there is a class of properties that are independent of the underlying material.

1. Zero Electrical Resistance: All superconductors have zero resistivity to low applied currents when there is no magnetic field present.

2. Critical Temperature T: In superconducting materials, the characteristics of superconductivity appear when the temperature T is lowered below a critical temperature To. The value of this critical temperature varies from material to material.

Conventional superconductors usually have critical temperatures ranging from less than 1K to around 20 K. Unconventional superconductors such as cuprate superconductors (e.g. 4Ba2 Cu3^{0}7) have much higher critical temperature. 4Ba2Cu3^{0}7 has a critical temperature of 92K. Explanation on how these materials exhibit superconductivity at higher temperatures is unsatisfactory.

3. Meissner Effect: When a superconductor is placed in a 'weak' external magnetic field H, the field penetrates the superconductor for only a short distance \ called the penetration depth, after which it decays rapidly to zero. This is called the Meissner effect, and is a defining characteristic of superconductivity. For most superconductors, the penetration depth is of the order of 100 nm.

The Meissner effect breaks down when the applied magnetic field is too large. Superconductors can be divided into two classes according to how this breakdown occurs:

1. Type I Superconductor: In them, superconductivity is abruptly destroyed when the strength of the applied field rises above critical value Hc. For example, Most pure elemental superconductors (except vanadium, niobium, technetium and carbon nanotubes) are type I.

2. Type II superconductor: In Type II superconductors, when the field applied is beyond a critical value HC^{1} it leads to a mixed state, in which increasing amount of magnetic flux penetrates the material, but there remains no resistance to flow of electric current. But at second critical field strength, HC^{2}, superconductivity is destroyed.

Ü *Applications and uses of Superconductors*

	Current application	Emerging application
I. Medical:		
• Magnetic resonance imaging	√	
• Biotechnical Engineering		√
II. Electronics:		
• SQUIDs	√	
• Josephson Junction Devices	√	
• Particle Accelerators	√	
• Sensors	√	
• Transistors		√
• Circuitry connections		√
III Industry		
• Seperation	√	
• Magnets	√	
• Sensors and Transducers		√
• Magnetic shielding		√
IV Transportation		
• Magnetically levitated vehicles	√	
• Marine Propulsion		√
V Power Generation		
• Motors		√
• Generators		√
• Energy Storage		√
• Transmission		√
• Fusion		√
• Transformers and Inductors		

Ques. 3 : Give an account of the technological innovations which is based on supercon-ductivity?

Ans. There have been many technological innovations based on superconductivity. Superconductors are used to make the most powerful electro magnets known to man. Super conducting magnets are essential components of several technologies. Magnetic Resonance Imaging (MR1) is playing an increasingly important role in diagnostic medicine. The intense magnetic fields that are needed for these instruments are a perfect application of superconductors. Similarly, particle accelerators used in high- energy phys-

ics study are very dependent on high field super conducting magnets.

The field of electronics holds great promise for practical applications of superconductors. The miniaturisation and increased speed of computer chips are limited by the generation of heat and the charging time of capacitors due to the resistance of the interconnecting metal films. The use of new super-conductive films may result in more densely packed chips which could transmit information more rapidly by several orders of magnitude. Super conducting electronics have achieved impressive accomplishments in the field of digital electronics. Superconductors are used to build Josephson junctions which are the building blocks of SQUIDs, (Superconducting Quantum Interference Devices) the most sensitive magnetometers known.

Magnetic-Levitation is an application where superconductors perform extremely well. Transrport vehicles such as trains can be made to 'float' on strong superconducting magnets, virtually eliminating friction between the train and its tracks. The conventional electromagnets when compared to superconductors would waste, much of electrical energy as heat and would be physically much larger than superconducting magnets. Magnetic Levitation Trains (MLT) currently exist in Japan and West Germany. MLTs offer an alternative to air transportation between cities up to a few hundred miles apart. Japanese MLTs generally run at speeds up to 500 kmph.

The ability of superconductors to conduct electricity with zero resistance can be exploited in the use of electrical transmission lines. Currently, a substantial fraction of electricity is lost as heat through resistance, associated with traditional conductors such as copper or aluminium. A large-scale shift to superconductivity technology depends on whether wires can be prepared from brittle ceramics that retain their superconductivity at higher temperatures (TTK) while supporting large current densities.

New applications of superconductors will increase with critical temperature The liquid nitrogen-based superconductors that exhibit superconductivity at higher temperature has provided industry more flexibility to utilise superconductivity as compared to 'conventional' liquid helium superconductors. The possible discovery of room temperature superconductors has the potential to bring superconducting devices into our every day lives.

Promising future industrial and commercial applications include transformers, power storage devices, motors, electric power transmission, etc. Most applications today employ the well-understood conventional superconductors, but it is expected that high- temperature superconductors will soon become more cost-effective in many cases. The rapid progress in the field of superconductivity leads one to believe that applications of superconductors is limited by only one's imagination and time.

Ques. 4 : Briefly discuss the research developments in the field of superconductivity?

Ans.

Recognising the importance of promoting superconductivity R&D and applications in the country, an apex body with Prime Ministers as chairman and a Programme Management Board (PMB) was constituted in 1987. In February 1991, the National Super conductivity Science and Technology Board (NSTB) replaced the apex body and the PMB.

The National Superconductivity Programme (NSP) was launched in 1988. In Phase-I (88-91) 65 projects were started in several institutions including the leading laboratories in DAE, CSIR, IITs in phase-N (91-95) 6 new projects were started. The following are the some of the achievements in superconductivity R&D.

1. High Temperature Squids: Scientists at National Physical Laboratory (NPL), New Delhi have developed a new SQUID at Liquid Nitrogen Temperature (UK). This is considered to be on the high temperature side so far as superconductors are concerned.

2. Superconducting Magnetic Ore separators: A Superconducting high gradient magnetic separator (SCHGS) has been developed at BHEL, Hyderabad with the help of NPL, BARC, Mumbai and National Mineral Development Corporation.

3. Super Conducting Compound: Monophasic compounds with a critical transition temperature (Tc of 110 K, 90 K and 80 K have been obtained by the Department of Nuclear Physics of Madras University.

4. Super Conducting Generator: Engineers at BHEL research centre at Hyderabad have built arid tested India's first superconducting generator, and synchronised it with Andhra Pradesh Power Grid. The achievement has ushered India into a new era of power generation at ultra low temperature.

INDIAN ECONOMY

INFLATION : CONCEPTS, FACTS AND POLICY

Ques. 1 : Define Inflation.

Ans. Inflation means a persistent rise in the price of goods and services. Inflation reduces the purchasing power of money. It hurts the poor more as a greater proportion of their incomes are needed to pay for their consumption. Inflation reduces savings; pushes up interest rates; dampens investment; leads to depreciation of currency thus making imports costlier.

Ü Depending upon the rate of growth of prices, inflation can be of the following types

Creeping inflation is a rate of general price increase of I to 5 percent a year. Creeping inflation of 3 to 5 percent erodes the purchasing power of money when continued over many years, but it is "manageable." Furthermore, a low creeping inflation could be good for the economy as producers and traders make reasonable profits encouraging them to invest.

Trotting inflation is usually defined as a 5 to 10 percent annual rate of increase in the general level of prices that, if not controlled, might accelerate into a galloping inflation of 10 to 20 percent a year. If it aggravates, galloping inflation can worsen to 'runaway" inflation which may change into a hyperinflation. Hyperinflation is inflation that is "out of control," a condition in which prices increase rapidly as a currency loses its value. No definition of hyperinflation is universally accepted. One simple definition requires a monthly inflation rate of 20 or 30% or more 'an inflationary cycle without any tendency toward equilibrium'. The worst is a monetary collapse, if prices are not reined in, in time.

Other related concepts are

- deflation when there is a general fall in the level of prices
- disinflation which is the reduction of the rate of inflation
- stagflation which is a combination of inflation and rising unemployment due to recession and
- reflation, which is an attempt to raise prices to counteract deflationary pressures.

Ques. 2 : Describe the measures of inflation.

Ans. ***CDP deflator***

GDP stands for gross domestic product, the total value of all final goods and services produced within that economy during a specified period. GDP deflator is a measure of the change in prices of all new, domestically produced, final goods and services in an economy. The GDP deflator is not based on a fixed market basket of goods and services but applies to all goods and services domestically produced.

COST OF LIVING INDEX

The cost of living is the cost of maintaining a certain standard of living. It is defined with reference to a basket of goods and services. When their cost goes up, CoL is said to be dearer and the index will go up. It has a value of 100 in the base year. An index value of 105 indicates that the cost of living is five percent higher than in the base year.

PPI

Producer price index (PPIs) measures the change in the prices received by a producer. The difference with the WPI is accounted for by logistics, profits and taxes, mainly, Producer price inflation measures the price pressure due to increase in the costs of raw materials. It may be absorbed by them or made up by increases in productivity or passed on to the consumers. It depends on the market conditions.

WPI

Wholesale price indices, which measure the change in price of a selection of goods at wholesale, prior to retail sales thus excluding sales taxes. These are very similar to the Producer Price Indexes.

CP1

Consumer price index measures the changes in prices paid by the consumer at the retail level. It can be for the whole community or group-specific for example, CPI for industrial workers etc as in India.

Ques. 3 : According to causes how many types of inflation?

Ans. There are four major types of inflation

- Demand-pull inflation: inflation caused

by increases in demand due to increased private and government spending, etc. It involves inflation rising as real gross domestic product rises and unemployment falls. This is commonly described as 'too much money chasing too few goods'. For example, India in 2010 when the economy is said to have overheated and demand outstripped supply and prices rose. Since supplies will be augmented to adjust to demand, prices will come down. It may be referred to as 'growth inflation' too. Demand- pull inflation can be caused by money supply increasing. For example, the expansionary monetary policy of the RBI in 2009 saw rates come down and easy and cheap credit pushed up prices as demand grew. Since 2010, repo rates were raised 11 times by July 2011 as RBI sought to control prices by reducing demand.

- Cost-push inflation: It is also referred to as "supply shock inflation," caused by reduced supplies due to increased prices of inputs, for example, crude prices globally have gone up causing supply constraints which means higher costs of production and so higher prices. Crude and food prices shot up in 2008 July. Other examples are, higher cost of capital, increases in prices of imported raw materials. Just as a shortage of goods tends to push prices up, an oversupply of commodities tends to induce the opposite effect on prices.
- Structural inflation: A type of persistent inflation caused by deficiencies in certain conditions in the economy such as a backward agricultural sector that is unable to respond to people's increased demand for food, inefficient distribution and storage facilities leading to artificial shortages of goods, and production of some goods controlled by some people. Food inflation currently being witnessed (2011) is structural in nature as the preference for protein foods is far ahead of its supplies and this is a phenomenon driven by income rise.
- Speculation
- Cartelization
- hoarding

Ques. 4 : Give an account of Impact of High Inflation?

Ans. If inflation is high in an economy, the following problems can arise

- Low income groups are particularly hurt
- People on a fixed income (e.g. pensioners, students) will be worse off in real terms due to higher prices and equal income as before; this will lead to a reduction in the purchasing power of their income.
- Inflation discourages exports as domestic sales are attractive and BOP problems can be caused. Inflation may erode the external competitiveness of domestic products if it leads to higher production costs such as wage increases, higher interest rate and currency depreciation.
- Inflation can drag down growth as interest rates are raised and cost of credit increases.
- Increasing uncertainty may discourage investment and saving. The savings pattern is affected thus: with the declining value of money, people would be more inclined to spend than save anticipating that their money can buy even less in the future. Therefore, with its adverse effect on savings, inflation can also discourage investment.
- Inflation tax happens. When a government borrows and spends, the cash held by people erodes in value due to inflation
- It will redistribute income from those on fixed incomes, such as pensioners, and shifts it to those who draw an inflation-linked income and businesses.
- strikes can take place for higher wages which can cause age spiral. Also if strikes occur in an important industry which has a comparative advantage the nation may see a decrease in productivity, exports and growth.

Ü *Small Amount of Inflation Can be Good*

It can be argued that a low level of inflation can be good if it is a result of innovation new products are

launched at - high prices, which quickly come down through competition. Therefore, there is encouragement for innovation and the problem is short lived. Also, a small price rise is necessary for' wages to go up. It further helps the economy keep off deflation which can otherwise set off a recession. Besides, inflation at a moderate level is an incentive to the producer. At any rate, small price rises are inevitable in a growing economy. Some see mild inflation as "greasing the wheels of commerce."

Ü *To Control Inflation*

There are fiscal, monetary, supply-side and administrative measures to control inflation to ideal/optimal rates though zero rate of inflation is never preferred for the reasons cited elsewhere in the lesson.

- Fiscal measures include reduction in indirect taxes
- Dual pricing like in sugar.
- Monetary measures include rate and reserve requirements changes. Open market operations can stabilize prices under normal conditions Also, sterilization through Government bond transactions as in the case of MSBs.
- Supply side factors include making goods available- import of wheat in India.
- Administrative measures include implementation of dehoarding and anti-black-marketing measures. Wage and price controls can also be used

Ü *Indices of Inflation*

Changes in the price levels at the wholesale and retail level are tracked by various price indices in India- WPI and CPI. CPIs exist for different consumer groups each of which is homogenous.

All price indices use a particular year as a "base year'. That means that rises or falls in prices are measured with reference to the price in that year. For example, the base year used for the Wholesale Price Index is 2004-05 since 2010. Wholesale prices of all products in the basket with their respective weightages in that year add upto 100.

Different base years are used for different price indices due to convenience, data availability, logistics etc.

Ques. 5 : Write a short notes on wholesale Price index?

Ans. Government launched a new series of wholesale price index (WPI) with 2004-05 as base from September 2010. Earlier 1993-94 was used as base year to calculate WPI. The new series of WPI has 676 items as against 435 items in the previous series. Consumer items widely used by the middle class like ice cream, mineral water, flowers, microwave oven, washing machine, gold and silver are reflected in the new series of WPI. This would give better picture of the price variation. Readymade food, computer stationary, refrigerators, dish antenna, VCD, petroleum products and computers will also be part of the new series.

Under primary article group of the new WPI, there are 102 items against earlier 98, while fuel and power category remains static at 19. In the new series, there are 555 items of manufactured products compared to 318 items earlier.

241 new items are there in the basket of commodities making up the official wholesale price index in a bid to reflect changes in India's price line and consumption pattern better.

The new series is based on the recommendations of a working group that was set up under Planning Commission Member Abhijit Sen.

Manufactured items now have a higher weight of 64.972 as against 63.749 earlier. The weight for fuels has also increased to 14.910 against 14.226. But for primary articles, the weight is down at 20.118 against 22.025.

In a bid to reflect the actual consumption pattern, the new series drops as many as 200 items such as typewriters, video cassette recorders, to make a room for items like computers, refrigerators, televisions and video disc players.

Government is also working on a two new indices to reflect the changes in the cost of services — one, on financial services and the other on trade and transport.

The WPI is published weekly by the Economic Advisor in the Ministry of Commerce and Industry, with a two week lag, tracks the wholesale traded price of 676 items that include agricultural commodities (such

as rice, tea, raw cotton, groundnut Oil seed), industrial commodities. Such as' iron ore, bauxite, coking coal), intermediate products for industry (such as cotton yarn, polyester fiber, synthetic resins, iron & steel, sheet glass), products for consumers (atta, sugar, paper, electricity, ceiling fans) and energy items (petrol, kerosene, electricity for commercial use). The weight attached to each item in the index is meant to reflect the volume (by value) of wholesale trade in that item in the Indian market.

The wholesale price index (WPI) is a vital guide in economic analysis arid policy formulation.

The WPI is not intended to capture the effect of price rise on the consumer though it generally and broadly indicates it.

WPI is the only price index in India which is available on a weekly basis with the shortest possible time lag of two weeks it has an all India character. It is due to these attributes that it is widely used in business and industry circles and in Government and is generally taken as an indicator of the rate of inflation in the

In short, The advantage of the WPI is that it covers more goods; is available with relatively small time lag of fortnight; is convenient to compile. Disadvantages are that it does not include services like transport, health, education etc.

This provisional weekly index is made final after a period of 8 weeks. The inflation rate is calculated on point to point basis i.e. on the basis of the variation between the index of the latest week of the current year and for the corresponding week of the previous 'ear.

There are a number of agricultural commodities, especially, some fruits and vegetables, which are of a seasonal nature. Such seasonal items are handled in the index in a special manner. When a particular seasonal item disappears from the market and its prices are not quoted, the index of such an item ceases to get compiled and its weight is distributed over the remaining items and new seasonal items, if any, in the concerned sub-group.

LIMITATION OF WPI

The accuracy of WPI is unsatisfactory even after the introduction of the revised series in 2010. Services such as rail and road transport, health care, postal banking and insurance, for example, are not part of the WPI basket. Neither are the products of the unorganized sector that are estimated to constitute about 35 per cent of the total manufactured output of the country. The index thus falls well short of being a broad based indicator of the price level even in its construction.

Government set up Abhijit Sen Committee on revising the WPI and the revised series was introduced in 2010 to broadbase the basket and update the goods.

From late 2009, government decided to have weekly release of inflation data on food and fuel prices on the WPI and monthly data on the general WPI. That is, inflation of primary goods within the WPI is reported on a weekly basis.

The earlier system was to release the wholesale price index every week and consumer price index, where food items have greater weightage, every month.

Ques. 6 : Write a short notes on consumer Price Index.

Ans. There are three Consumer Price Indices in India. Each tracks the retail prices of goods and services for specific group of people, because the consumption patterns of different groups differ.

For Industrial Workers (CPI-IW), a basket of 370 commodities is tracked; for Urban Non-Manual Employees (CPI-UNME), 180 commodities; for Agricultural Labourers (CPI-AL), 60 commodities. The respective base years are 2001, 1984-85 and 1986-87. The first two indices have services in them. These baskets and the weightages to each item have been determined on the basis of surveys of consumption patterns. Information also differs from centre to centre around the country, the all-India figures declared are averages.

Mahatma Gandhi NAREGA wages are to be indexed to the CPI (AL) from the beginning of the year 2011.

CSO decided to discontinue CPI (UNME) from 2008.

Each commodity is given a specific weightage, which differs from one index to another index. For example, the CPI-AL would give a greater weightage to foodgrains than the CPI-UNME, since a greater proportion of the agricultural labourer's expenditure would go toward foodgrains, and he would be unlikely to buy the sort of items the office-goer would buy.

The coverage of CPI IW is broader than the other

indices of CPI like the CPI for agricultural laborers (AL) and the CPI for urban non-manual employees (UNME).

In the organised sector, CPI-IW is used as a cost of living index.

CPI-AL and CPI-UNME are not considered as robust national inflation measures because they are designed for specific groups of population with the main purpose of measuring the impact of price rise on rural and urban poverty.

In accordance with the Government of India (Allocation of Business) Rules, 1961, as amended from time to time, it is the responsibility of the Ministry of Labour to compile and release the data on the CPI for Industrial Workers and the data on the CPI for Rural Labourers. It was the responsibility of the Ministry of Statistics and Programme Implementation to compile and release the data on the CPI for Urban Non-Manual Employees.

The Government of India (Allocation of Business) Rules, 1961, with subsequent amendments, assigns the responsibility for compiling the WPI to the Office of the Economic Adviser in the Department of Industrial Policy and Promotion under the Ministry of Commerce and Industry. The Economic Adviser holds the final authority for all decisions regarding the WPI.

The national income deflator (GDP deflator) is a comprehensive measure statistically derived, from national accounts data released by the Central Statistical Organization (CSO). Since it encompasses the entire spectrum of economic activities including services, the scope and coverage of national income deflator is wider than any other measure. At present, the GDP deflator is available only annually with a long lag of over one year and hence has very limited use for the conduct of policy.

Ques. 7 : What is the difference between wholesale price Index and consumer price Index?

Ans. WPI measures price rise at the wholesale level. Wholesale means sale in large quantities and meant for resale It covers a certain set of goods that are traded at the wholesale level. CPI on the other hand measures price rise at the retail level. There is a difference between the two. The difference is due to a number of factors. A substantial portion of the differential is accounted for by the retailers margins which are built into what the consumer pays. Besides, the way the two indices are calculated differs both in terms of weightage assigned to products as well as the kind of items included in the basket of products.

While wholesale prices are more or less the same throughout the country, consumer prices or retail prices vary across regions (rural and urban) and also across cities according to the consumer preferences for certain products, supplies and purchasing power. Besides, taxes levied by states comprise an important component of the variation in prices of many products. Therefore, give WPI an important place in government policy as it is more representative; figures come quickly relatively; and has an all India character.

Ü ***Which Index Should One Use?***

The WPI is useful in certain contexts. For example, for industrialists, the costs of setting up a factory over the course of several years; and further to calculate the costs of production and returns over several years. The basket of items in the CPI does not include machinery, chemicals, and so on; secondly, the price of electricity in the CPI is the consumer tariffs, not the industrial tariffs; and so on.

Figures for inflation in the WPI are on the average much lower than those in the CPI indices. There could be two reasons for this difference in rates between the WPI and CPI: first, prices of the items in the CPI basket might have risen more sharply than items excluded from it — this would mean that prices of mass consumption goods have risen more sharply than inputs for production; secondly, the retail prices of commodities might have grown more sharply than the wholesale prices, indicating that middlemen have taken a bigger share;

Ü ***Services and Price Index***

While the WPI now does not include services, the two consumer price indices (CPI) meant for urban non-manual employees and industrial workers, do include certain services such as medical care, education, recreation and amusement, transport and communi-cation. On the other hand, some of the other major services such as trade, hotels, financing, insurance, real estate and business services do not find a mention either in the WPI or in the CPIs.

In India, the services sector accounts for about 55 per cent of the GDP.

In 2010, Department of Industrial Policy and Promotion (DIPP), Ministry of Commerce & Industry constituted an Expert Committee to render technical advice for development of Service Price Index

(SPI) and its related issues. The Committee is chaired by Prof. C.P. Chandrasekhar,

Ü *Producer Price Index*

The process of introducing the producer price index (PPI) is also underway in India, according to Dr. Abhijit Sen, Member of Planning Commission. It means prices of goods as they are sold to the wholesalers by the producers. The difference between WPI and PPI is accounted for by the margins and other transport and distribution costs.

Ü *'Core' or' Underlying Inflation'*

Core or underlying inflation measures the long-run trend in the general price level. Temporary effects on inflation are factored out to calculate core inflation. For this purpose, certain items are usually excluded from the computation of core inflation. These items include: changes in the price of fuel and food which are volatile or subject to short-term fluctuations and/or seasonal in nature like food items. In other words, core or underlying inflation is an alternative measure of inflation that eliminates transitory effects. These price changes are not within the control of monetary policy as much as these are supply shocks.

The main argument here is that the central bank should effectively be responding to the movements in permanent component of the price level rather than temporary deviations.

Ques. 8 : What do you mean by Inflation Targeting?

Ans. Inflation targeting focuses mainly on achieving price stability as the ultimate objective of monetary policy. This approach entails the announcement of an inflation target- either a number or a range, that the central bank promises to achieve over a given time period. The targeted inflation rate will be set jointly by the RBI and the government, although the responsibility of achieving the target would rest primarily on the RBI. This would reflect an active government participation in achieving the goal of price stability with fiscal discipline by way of a rational borrowing programme (not borrowing in excess).

Monetary policy and fiscal policy have to converge for achievement of inflation targeting. Advantage is that it promotes transparency in the conduct of monetary policy. Further, it increases the accountability of monetary authorities to the inflation objective.

Prices impact on the macro economy in many ways — welfare of people, growth and stability of the economy in a globalised order.

Ques. 9 : What do you mean by Ideal Inflation Rate?

Ans. Ideal inflation rate is one that takes into consideration human, social and economic impact. It is the level of inflation beyond which the adverse consequences are strong. Chakravarty Committee (1985) had indicated 4 per cent as an acceptable level of inflation on a long-term basis. However, such a level of inflation cannot be fixed at one level for all times. It depends on growth rate. It also depends on what the global levels are. RBI sees about 5.5% rate of inflation as 'comfortable' neither does it hurt in human terms nor in growth terms.

Ü *Collection of Statistics Act, 2008*

Collection of Statistics Act, 2008 was made to bring in new rules aimed at improving data collection.

Government will levy higher penalty for not sharing data and tougher punishment will be imposed in cases where manipulation of data is involved, they say.

Under the new Act, people or companies not divulging data would have to pay a fine of Rs 1,000 and they would be given a 14-day notice period to comply. If the information is not provided even after two weeks the penalty will rise to Rs 5,000 per day.

Under the old Act, which was passed in 1953, the penalty was only Rs 500 for the first default and Rs 200 per day thereafter.

The new penalty scheme will ensure that data collection is done on time. It will increase the accuracy of the data.

The Act also makes wilful manipulation or omission of data a criminal offence, punishable by a prison term that may extend up to 6 months. This penalty will also apply if a company prevents or obstructs any employee from collecting data.

The Collection of Statistics Act, 2008 gives powers to the government to classify any statistics as "core statistics" and also determine the method to collect and disseminate the same.

Ques. 10 : What is Philips's Curve?

Ans. The inverse relationship between rate of inflation and rate of unemployment is shown in the Phillips curve: price stability has a trade-off against employment. Some level of inflation could be considered desirable in order to minimize unemployment

Potential output (sometimes called the natural

gross domestic product) is an important concept in relation to inflation. It is the level of GDP where the economy is at its optimal level of production, given various constraints- institutional and natural.

This level of output corresponds to the Non-Accelerating Inflation Rate of Unemployment, NAIRU. If GDP exceeds its potential, inflation will accelerate and if GDP falls below its potential level, inflation will decelerate as suppliers attempt to use excess capacity by cutting prices.

Ques. 11 : Define Deflation and point out its remedy.

Ans. Deflation is a prolonged and widespread decline in prices that causes consumers and businesses to curb spending as they wait for prices to fall further. It is the opposite of inflation, when prices rise, and should not be confused with disinflation, which merely describes a slowdown in the rate of inflation.

Deflation occurs when an economy's annual headline inflation indicator -- typically the consumer price index -- enters negative territory:

Deflation is hard to deal with because it is self-reinforcing. Put simply, unless it is stopped early, deflation can breed deflation, leading to what is known as a deflationary spiral.

When an economy has fallen into deflation, demand from businesses and consumers to buy products falls because they expect to pay less later as prices fall. But as producers struggle to sell and go bankrupt, unemployment rises, reducing demand further. That causes deflation to become more pronounced.

It makes it more expensive to service existing debts. This is as true of governments, who have borrowed trillions of dollars globally to prop up the financial sector, as it is for consumers.

As debt becomes more expensive to pay off, the risk of default and bankruptcy rises too, making banks more wary of lending. This reduces demand and further exacerbates the deflationary problem.

REMEDY

- Tax cuts to boost demand from consumers and businesses
- Lowering central bank interest rates to encourage economic activity
- Printing more currency to boost money supply
- Capital injections into the banking system
- Increase government spending on projects that boost the return on private investment

India did not face the threat of deflation as demand has not dropped so much. Also, food scarcity meant food prices did not fall. In fact they rose.

Ü *India and Deflation*

On the WPI, we faced disinflation- rate of growth of prices fell but not prices themselves till the first quarter of 2009. In the second quarter and later, there was 'deflation' on the WPI. This negative inflation is due to higher base as inflation peaked in July 2008 due to international energy and food price rises because of speculation.

The deflationary phase was short lived for a few weeks as the fiscal as well as monetary measures of the government started showing results and demand and growth returned.

Ü *Growth -Inflation Trade Off*

With high growth, economy overheats as in India today (2011).Overheating of the economy means demand overshoots supply and there is pressure on prices. As growth creates more employment and incomes rise, demand rises pushing up prices.

As prices rise, the central bank intervenes and raises rates to cool consumption and so prices fall relatively. Repo and reverse repo rates- the policy rates are the tools available to the central bank as signals to the economy that it is ready to act to soften prices - partly because the poor suffer disproportionately and partly because inflation can, derail the medium and long term growth.

Such intervention by the central bank has a dampening impact on growth as higher interest rates prevent easy borrowing and thus demand slackens.

We witnessed the same in India with CRR and repo rates going up consistently peaking in 2008 July- aimed at balancing growth and inflation. It led to deceleration of growth rate. We thus see growth being 'softened' to ease inflation in the country. It is a trade off between growth and inflation. With the onset of the Great Recession in late 2008, the battle was to arrest deceleration of growth and so RBI brought down rates. But from 2010, when growth and inflation returned and inflation became a severe problem, RBI raised the policy rates ii times by 2011 July.

Thus, growth and inflation are intimately connected- one being traded off for the other depending upon where the growth situation stands.

As prices stabilise, growth resumes and -a new and higher base is set for the growth process.

Growth and inflation do have a trade off but that is only in the short term. As Dr. C. Rangarajan says, growth is a marathon while overheating and slow down are temporary pauses to gain greater strength.

Fiscal drag operates in an overheated economy. That is the tax liability increases as wages rise. That leaves less purchasing power in the hands of the people and so demands drops automatically. It acts as an automatic stabilizer.

Ü *Inflation in India*

India's inflation rate went into negative figures and India entered into deflation for the first time in 30 years in June 2009. It is the continuation of the trend that started in August 2008 when inflation peaked at 13% on the WPI. However, it is a statistical deflation as the high base on 2008 makes the price rise look negative. Also, average price rise is negative due to preponderance of industrial goods in WPI. But food prices rose and the CPI was above 10%. Thus, the drop in the demand for industrial goods is captured by the WPI but not wage goods and food.

The drop in prices is attributed to

- Slackening demand globally and nationally
- Commodity prices fell since last year-crude etc.
- Excise duty and service tax rates came down
- Job losses and decline in demand

Ü *Government's Steps to Control Inflation*

The Government has taken a number of short term and medium term measures to improve domestic availability of essential commodities and moderate inflation.

It has procured record food grains. Even after keeping the minimum buffer stock, there are enough food grains to intervene in the market to keep the prices at reasonable level.

A Strategic Reserve of 5 million tonnes of wheat and rice has also been created to offload n the open market when prices are high. This is in addition to the buffer stock held, by FCI every year.

Issue price of grains supplied through PDS outlets are frozen.

The price situation is reviewed periodically at high-level meetings such as the Cabinet Committee on Prices (CCP).

Ques. 12 : What is Open inflation?

Ans. When the government does not attempt to prevent a price rise, inflation is said to be open. Thus, inflation is open when prices rise without any interruption. In open inflation, the free market mechanism is permitted to fulfill its historic function of rationing the short supply of goods and distribute them according to Consumer's ability to pay. Therefore, the essential characteristics of an open inflation lie in the operation of the price mechanism as the sole distributing agent.

Ques. 13 : What is Repressed inflation?

Ans. When the government interrupts a price rise, there is a repressed or suppressed' inflation. Thus it refers to those conditions in which price increases are prevented at the present time through an adoption of certain measures like price controls and rationing by the government, but they rise on the removal of such controls and rationing. The essential characteristic of repressed inflation, in contrast to open inflation, is that the former seeks to prevent distribution through price rise under free market mechanism and substitutes instead a distribution system based on controls. Thus, the administration of controls is an important feature of suppressed Inflation Repressed inflation is criticized as it breeds number of evils like black market and uneconomic diversion of productive resources from essential industries to non-essential or less essential goods industries since there is a free price movement in the latter and hence are more profitable to investors.

Ü *Inflation tax*

Price rise means more money being paid by the consumers for what they buy. Thus, it is a type of tax.

Ü *Producer Price Index*

India will have another gauge of price changes, the producer price index (PPT), completing the bouquet of indices needed for a holistic picture of inflation in the economy.

The ministry of industry has set up an internal committee to prepare a framework for the new index. The committee has commissioned studies to arrive at a commodity basket for the PPI. The producer price index would help us in looking at the margins.

The PPI measures changes in prices received by domestic producers of goods and services over time. This is different from the retail price paid by consumers that include logistics costs, taxes and other levies.

It will give an account of the economy's efficiency in transferring goods and services from the producer to the consumer.

India has five gauges of inflation, measuring prices from the Wholesale level to the retail level. The WPI is the most widely followed index for inflation and there are four consumer price indices. The WPI measures prices recorded in bulk transactions, while the consumer price indices measure prices paid by the consumer. The current WPI series was launched in September 2010 with 2004-05 as the base year.

The WPI would typically have some taxes such as excise levies and logistics costs already bundled in. Once the PPI is in place, there would not be any need for the WPI.

The working group report further said the WPI could eventually be discontinued. The US had converted its wholesale price index into a producer price index in 1978.

What is producer price index, or PPI?

It is a selling price for producers. It is usually the first commercial transaction in goods and services produced

Flow does PPI differ from WPI?

WPI measures prices at the wholesale level and includes certain taxes and costs. PPI is a measure of what the producer gets and not what buyer pays, which includes taxes

Why is a PPI needed?

Together with the retail price indices, it gives an idea of margins on different products and incidence of taxes. It indicates the cost pressures in an economy.

Ü *New Price Index for Urban, Rural Consumers*

The Central Statistics Office (CSO), Ministry of Statistics and Programme Implementation has introduced a new series of Consumer Price Indices (CPI) on base 2010=100 for all-India and States/UTs separately for rural, urban and combined with effect from January, 2011.

The two new consumer price indices one for the entire rural population and the other for the entire urban population were announced from February 2011.

Current price indices relate only to various segments of the rural and urban populations, a gap which the two new indices seek to remove.

Later the government will club the two and come up with a national consumer price index to be used to calculate dearness allowance and pay structures.

The indices are available for five major groups — food, beverages and tobacco, fuel and light, housing, clothing, bedding and footwear, and miscellaneous.

The data is updated every month.

For the price index for urban areas, 310 towns have been selected, which include capitals of all states and Union territories.

To monitor the price movement in rural areas, the government has selected 1,181 villages.

IMPORTANT INDICES

Ques. 1 : What do you mean by Global Hunger Index?

Ans. The Global Hunger Index (GHI) is a multi-dimensional statistical tool used to describe the state of countries' hunger situation. The Index is developed by the International Food Policy Research Institute (IFPRI), Washington. Irish NGO Concern Worldwide joined the group as co-publisher later. India has been ranked 67, below neighbouring countries like China and Pakistan. The index rated 81 countries on the basis of three leading indicators- prevalence of child malnutrition, rate of child mortality, and the proportion of people who are calorie deficient.

China is rated much ahead of India at the fourth place, while Pakistan is at the 59th place on the 2011. In India, the high Index scores are driven by high levels of child underweight resulting from the low nutritional and social status of women in the country, the report pointed out, adding that India alone accounts for a large share of the world's undernourished children.

Ques. 2 : Write a short notes on Global Gender Gap Index 2011?

Ans. According to the Global Gender Gap report issued by World Economic Forum, India is ranked 113 out of total 135 countries. Iceland topped the Global Gender Gap rankings showing greatest equality between men and women, followed by Norway, Finland, Sweden, and New Zealand respectively. Yemen was last in the list at 135.

The Global Gender Gap Report assesses 135 countries on how well they divide resources and opportunities amongst male and female populations. Gap

is measured in the areas of economic participation and port unity, educational attainment, political empowerment, and health and survival.

The lower literacy rate of females (54%) in India is a prime reason of the gender gap. Though India's higher Education system is third largest in the world, after China and the U.S.A. still the country manages a Literacy rate of just 65% and females stand far behind.

The report alarms India to take urgent steps to make women as equal partners in the society and eliminate tender inequality. Lesser gender gaps would also bring in an environment for the country to grow and prosper.

"Girls and women make up half of the world's population and without their engagement, empowerment and contribution, we cannot hope to achieve a rapid economic recovery nor effectively tackle global za1lenges such as climate change food security and conflict," said Klaus Schwab, founder and executive chairman, WEF, while releasing the report.

Not all sectors are seen as laggards when it comes to empowering women. Says Poornima Shenoy, President, India Semiconductor Association: "It is definitely heartening to see girls competing at every level with the boys. In the tech sector, we see a high percentage of girls joining the work stream. There are fewer women joining the hardware space due to preconceived notions which we need to actively address. My level of concern comes at the senior executive positions. We have only 2-3 per cent of positions filled by women at decision maker levels. This is due to the higher dropout rate at the mid management positions. It is often difficult for women to support children's education needs, family responsibilities and increasing work pressures. Work today extends beyond office hours making women have to burn the candle at both ends. Mentoring and coaching by organisations are important at this stage."

"Indian women have come a long way as they have started to make significant contribution in the corporate world, but few swallows don't make a summer, India Inc has to go a long way in terms of gender equality at employment. Increased deployment of IT in the corporate sector, including areas such as automated process controls etc which traditionally were male dominated, has opened new vistas for women. Further, the growth of the IT and electronics industry itself - software, services has been a great blessing in terms of creating job opportunities for the fairer sex".

Ques. 3 : What do you understand by Innovation Index?

Ans. Success of a country depends upon capital it has and the capital it can generate. Capital is mostly generate by innovation. Whenever innovation comes down or the countries stop investing in education and research the result shows directly oh their economy. Innovation is the hallmark of developed nations. The Global Innovation Index is a barometer of the countries' wealth, knowledge and competitiveness.

Switzerland stood number one followed by Sweden and Singapore. The countries listed in the top 10 are the developed nations.

The methodology involves rating the countries on 5 inputs for getting 3 outputs. Based on the score of the outputs the ranking of the countries is decided. The Inputs and outputs are classified even further.

Inputs:

1. Institutions and policy
2. Human capability
3. Infrastructure
4 Research sophistication
5. Business market and capital

Outputs:

1. Knowledge
2. Competitiveness
3. Wealth

INSEAD (European Institute for Business Admn) and the Confederation of Indian Industry made the Innovation Index. In the 2011 Global Innovation Index report, India is ranked 62.

India started to liberalise its economy only recently. New India or India 2.0 is only 19 years old if we start counting from 1991. Since then India grappled with expanding economy remarkably well.

There are many innovations in India. Be it Chandrayan or the Pentium chip or the Nano car, cracking the TB genome or making sense of the Hu-

man genome by CSIR. India can make all types of sophisticated satellites. They stand for innovation.

With India becoming a global hub for R and D and the IPR regime becoming modernized, the innovation gory will make more headlines.

The solar powered rickshaw–Soleckshaw, the new-age solar-electric vehicle was recently wheeled into Delhi. The dual-powered cycle is operated both by a solar-charged battery and by pedal power. The result is significant ease on the strain of the poor man.

Use of e-governance for PDS shops with RFID another innovation.

R.s.1500 laptop introduced by the Government IS another example.

Innovation Universities are being set up.

Ques. 4 : What are the outcomes of Recent Global manufacturing Competitiveness Index?

Ans. The rise of India as a serious player in global manufacturing is gathering pace as Deloitte's Global manufacturing Competitiveness Index, compiled in conjunction with the U.S. Council on Competitiveness ranks the country second only to China. The Index-is-based on the responses of more than 400 chief executive officers and senior manufacturing executives worldwide to a survey conducted in late 2009 and early 2010. The Index also draws on select interviews with key manufacturing decision makers.

The report indicates that access to talented workers capable of supporting innovation is the key factor driving global competitiveness at manufacturing companies — well ahead of "classic" factors typically associated with competitive manufacturing, such as labor, materials, and energy.

The report identified the emergence of a new group of leaders in the manufacturing competitive index over the next five years. These include Mexico, Poland and Thailand — countries not always considered alongside longer-standing, up-and-corners like Brazil and Russia. Not unexpectedly, Asian giants like China, India, and the Republic of Korea are projected to dominate the index in five years, as they do now. Further, dominant manufacturing super powers of the late 20th Century — the United States, Japan, and Germany — are expected to become less competitive over the next five years. The Index also identified a clear geographical divergence in the perception of public policy support for competitiveness. Most respondents from China think that their government makes competitiveness easy compared to respondents in Europe-and-the United States, with 70 percent of them citing- government support of science, technology, and innovation as advantageous.

India's rich talent pool of scientists, researchers, and engineers as well as its large, well-educated English- speaking workforce and democratic regime make it an attractive destination for manufacturers. Since the mid-1990s, India's software industry has escalated to new heights and post-economic liberation has also opened a pathway to unprecedented market opportunities for Indian manufacturing. Moreover, beyond low cost, Indian manufacturers gained experience in quality improvement and Japanese principles of quality management, with the largest number of Deming Award winners outside of Japan. The country is also rapidly expanding its capabilities in engineering design and development and embedded software development, which form an integral part of many modern-day manufactured products', the report added.

With emerging economies of China and India leading the way, the report also describes how the global manufacturing epicenter is gradually shifting from the traditional manufacturing bases of the US, Germany and Japan to Asia. Innovative talent, lower costs, open government policies and global manufacturing projects are paving the way for this shift.

The Deming prize was originally designed to reward Japanese companies for major advances in quality improvement. Over the years it has grown and it is now also available to non-Japanese companies. Some Indian corporate that received it are M&M, Tata Steel, TVS, Sundaram Clayton.

Ques. 5 : Give an account of Global Competitiveness Index 2011-12?

Ans. India has slipped to 56th from the 51st spot in the World Economic Forum's annual Global Competitiveness Report (GCR) 2011-2012 among 139 countries rated for institutions, policies, and factors

that determine the level of productivity.

The top ten ranked countries have retained their spots since 2009. While Switzerland is first for the third consecutive year, Singapore is second and Sweden is at the third spot.

"Switzerland, a model country, has the most effective and transparent public institutions in the world with a level playing field, an independent judiciary, strong rule of law, and highly accountable public sector," said the report.

"India has failed to improve significantly on any of the basic drivers of its competitiveness," said the report. But its large market size, good results in more complex areas including financial markets, business sophistication and innovation make it competitive.

India shows up poorly when it comes to institutions. It ranks 71 in diversion of public funds, 88 in the public's trust of politicians, 83 in irregular payments and bribes, 72 in favouritism in decisions of government officials, 57 'in wastefulness of government spending, 95 in burden of government regulation, 127 in business costs of terrorism, 67 in business costs of crime and violence, 73 in organised crime, 68 in reliability of public services, 70 in ethical behaviour of firms and 76 in efficacy of corporate boards.

However, India ranks 42 in transparency of government policy making, 45 in its strength of auditing and reporting standards3 in strength of investor protection, 41 in judicial independence, 47 in legal framework in dispute settlement and 37 in legal framework in challenging regulations.

India's macroeconomic environment continues to be characterised by persistent budget deficits (80), high public debt (115) and high inflation (123 out of 139). However, it ranks ninth in national savings rate.

India is 104th in health and primary education, with high rates of communicable diseases and high infant mortality (III).

Life expectancy in India (rank 109) is 10 years less than in Brazil and China. The quality of primary education remains fairly poor (rank 98), despite becoming universal.

Higher education also is a weak point, with low enrolment rates at secondary (rank 108) and tertiary (rank 101) levels. It is 39 in the quality of its educational system, and 23 in the quality of its management schools.

The World Economic Forum (WEF) defines national economic competitiveness as "the set of institutions, policies and factors that determine the level of productivity of a country." Its index (from the Global Competitiveness Report's Global Competitive Index [GCI]) is calculated from both publicly available data and the Executive Opinion Survey, an annual survey conducted by the WEF together with its network of Partner Institutes (leading research institutes and business organizations). According to the WEF, the report-assesses the ability of countries to provide high levels of prosperity to their citizens. This in turn depends on how productively a country uses available resources. Therefore, the GCI measures the set of institutions, policies, and factors that set the sustainable current and medium-term levels of economic prosperity." WEF has published its Global Competitiveness Reports since 1979.

The WEF's Global Competitive Index is based on 12 "pillars of competitiveness" divided into three "pillar groups," that emphasize different aspects of market efficiency:

- Basic Requirements (institutions, infrastructure, macroeconomic stability, health and primary education).
- Efficiency Enhancers (higher education and training, goods market efficiency, labor market efficiency, financial market sophistication, technological readiness, market size)
- Sophistication Factors (business sophistication innovation)

The World Economic Forum has ranked 142 economies in its 2011-2012 Global Competitiveness Report. In overall competitiveness India scores 56th place. It ranks notably ahead of Latin America's powerhouse Brazil (58) and way ahead of its neighbours Pakistan (123), Sri Lanka (62) and Bangladesh (107), but behind China (27).

The global competitiveness rankings are viewed as a barometer of the business climate in 142 countries and mirrors the assessments of leading businessmen on a range of political, social, and economic parameters.

Though Switzerland has [state-supported] monopolies in key sectors, it maintains overall economic stability and largely open trade and investment policies.

India has been pushed down to 56th position from 51st due to its poor performance in a range of social sector areas such as education, health and infrastructure.

Though India has performed well in complex financial sector areas, attaining the 17th rank globally in terms of its financial markets, 44th in business sophistication and 39th in innovation, it has failed to improve the basic drivers of competitiveness, the report said.

"There are two India's while there is widespread poverty, poor health and education facilities and poor infrastructure in rural India, the other India is experiencing rapid growth."

The WEF, which is a non-government organisation is largely known for its annual Davos show of captains of industry and business and political leaders. In the face of a growing economic crisis in the western world, the WEF has increasingly promoted "compassionate capitalism" as an economic model.

After Infrastructure, biggest hurdles to do business in India is Government Bureaucracy and Corruption. Here are the individual parameter rankings based on which the total competitiveness is derived from:

India ranks well on innovation and sophistication factors, which are actually forte of more developed and richer countries. India also boasts fairly well functioning institutions, bustling financial markets, and a sound banking sector .However, India ranks very poorly on some of the basic determinants of competitiveness, namely health and primary education, macroeconomic stability and infrastructure.

Ques. 6 : Briefly discuss the Ease of Doing Business Index.

Ans. India which is expected to be economic power house is unfriendly to entrepreneurs who want to setup business in India. World Bank (IFC) has released the rankings for 2011 for doing business in 183 countries. India is at a ranking of 132.

This report is extremely important because, FDIs and private equity groups follow it carefully to park their investments.

Factors for India's downslide are the number of tax payments required by the companies and the inefficiency of court system to resolve any legal matters. World Bank survey focuses on 10 indicators which includes the time and cost involved to meet the government regulations to start, run and close a business.

The 10 indicators are

- Starting a business
- Dealing with construction permits,
- Employing workers
- Registering property
- Getting credit
- Protecting investors
- Paying taxes
- Trading across borders
- Enforcing contracts
- Closing a business

Started in 1948 by the US-based Institute of Supply Management the Purchasing Managers' Index, or PMI, has now become one of the most closely watched indicators of business activity across the world. ET explains how the index works and what it means:

Ques. 7 : Write a short notes on Purchasing Managers Index?

Ans. PMI or a Purchasing Managers' Index (PMI) is an indicator of business activity -- both in the manufacturing and services sectors. It is a survey-based measures that asks the respondents about changes in their perception of some key business variables from the month before. It is calculated separately for the manufacturing and services sectors and then a composite index is constructed.

The PMI is derived from a series of qualitative questions. Executives from a reasonably big sample, running into hundreds of firms, are asked whether key indicators such as output, new orders, business expectations and employment were stronger than the month before and are asked to rate them.

A figure above 50 denotes expansion in business activity. Anything below 50 denotes contraction. Higher the difference from this mid-point greater the expansion or contraction. The rate of expansion can also be judged by comparing the PMI with that of the previ-

ous month data. If the figure is higher than the previous month's then the economy is expanding at a faster rate. If it is lower than the previous month then it is growing at a lower rate.

The PMI is usually released at the start of the month, much before most of the official data on industrial output, manufacturing and GDP growth becomes available. It is, therefore, considered a good leading indicator of economic activity. Economists consider the manu-facturing growth measured by the PMI as a good indicator of industrial output, for which official statistics are released later. Central banks of many countries also use the index to help make decisions on interest rates.

The PMI also gives an indication of corporate earnings and is closely watched by investors as well as the bond markets. A good reading enhances the attractiveness of an economy vis-a-vis another competing economy. It works as a business confidence and by implication consumer confidence index.

Ques. 8 : Briefly discuss the IGEP?

Ans. India has moved up to fifth position in a list ranking the governments of 112 countries in terms of their ability to project the economy into the international sphere, as per the Economic Survey 2010-11.

In 2000, the country was ranked 10th in the Index of Government Economic Power (IGEP), it said. As per the IGEP the Survey said India was among the best performers on the globe in terms of its ability to raise resources, credit-worthiness and credibility in international financial markets.

According to the IGEP 2009, the US was at the top of the list, followed by China, Japan, Germany, India, Russia, Brazil, France, Italy and the UK.

"Among the top ranking economies, some of the most dramatic rises in rank have been... India's rise from 10th position in 2000 to fifth in 2009," the Survey said.

The IGEP endeavours to capture the ability of a government to project itself in the international sphere and is composed of four variables -- government revenues, foreign currency reserves, export of goods and services and human capital.

It is a study authored by chief economist advisor Kaushik Basu.

India moved up three notches from eighth in 2000 to fifth in 2009, thanks partly to the sustained 9%-plus growth in the years preceding the global financial crisis that saw the country's share in global GDP rise to 5.4% in 2010.

The index is based on government revenues, human capital and the ability to influence foreign markets (judged with foreign exchange reserves and exports of goods and services). "These variables broadly reflect aspects that contribute to a government's economic clout, voice and negotiating leverage by capturing elements like its ability to raise resources, its creditworthiness and credibility in international financial markets, its influence on global economic activity and its potential in terms of human resources," say the study, which was co-authored by Supriyo De, Rangeet Ghosh and Shweta.

India's economic growth has catapulted its economic power consequently its stature has grown significantly. India's share in world exports of goods and services has increased from 0.7% in 2000 to 1.7% in 2010. And in terms of potential human capital, India's share in world population is 17.8% in 2010 up from 16.6% in 2000.

Ques. 9 : What do you understand by PISA?

Ans. The world education rankings from the OECD are given periodically. In the latest findings, UK is slipping down in maths, reading and science, and has been overtaken by Poland and Norway, this major study of 65 countries reveals.

Around 470,000 15-year-olds across the world sat a numeracy, literacy and science test last year, the results of which inform the latest Pisa study by the Paris-based Organisation for Economic Co-operation and Development (OECD).

PISA rankings within OECD: Illustration: Paul Scruton for the Guardian

The Programme for International Student Assessment (Pisa) is highly respected across the globe, and enables politicians and policy-makers to assess how different country's education systems compare.

Assessments of around 16,000 students from around 400 schools in Tamil Nadu and Himachal Pradesh will I feature in the Programme for Interna-

tional Student Assessment (PISA) in 2011.

India had participated in the PISA assessment during 2010-end. However, the results of the assessment will be declared later in 2011. This had been the first such attempt by India at the ratings that are considered prestigious.

Although only two states are being currently assessed by the PISA, India would be going for a country-wide assessment after the results for Himachal Pradesh and Tamil Nadu have been declared.

Institutes of higher education in India had not been able to make much of a mark in global assessments or rankings except the Indian Institutes of Technology (IITs). It is being said that there may still be hope for Indian schools in the world rankings.

INDIAN POLITY

ANTI—DEFECTION LAW

Ques. 1 : 'Defections are a source of political instability'. In this context examine the steps taken to address defections in India?

Ans. Defections are a source of political instability; breach or representative faith and indicate power-hunger among legislators. Therefore, they need to be prevented and punished.

The Anti-defection Law made by the Constitution (Fifty-Second Amendment) Act, 1985 aims to do that. It amended Articles 101, 102, 190 and 191 of the Constitution regarding vacation of seats and disqualification from membership of Parliament and State legislatures respectively and inserted a new Schedule (Tenth Schedule) to the Constitution setting out certain provisions regarding disqualification from membership of Parliament and the State Legislatures on the ground of defection, from the political party to which the Member belongs.

Anti-Defection Law details the grounds of defection and also prescribes disqualification for the defectors for being Members of the House. The grounds of detection are as under:

- If a member of the House belonging to a political party voluntarily gives up his/her membership of that political party.
- if he/she abstains from the voting or votes contrary to the direction issued by the political party to which he/she belongs in the House.
- If he/she defects from his/her party to any patty after elections.
- If the nominated member joins any political party after six months after taking his scat.
- An independent Member who joins a political party after his/her election.
- Member who acts in defiance of party direction (Party Whip) and if such defiant action is not condoned by the Chief Whip within 15 days. The Chief Whip may condone the same and recommend to the Speaker/Chairman that the member should not be disqualified
- Originally, the law protected bulk defections' in the nature of split (one third of legislature party). However, Constitution (Ninety-first Amendment) Act 2003 made splits illegal too.

Ques. 2 : Exemptions given under the Anti-defection in India is a major source of ineffectiveness of the law in preventing defenctions. Elaborate?

Ans. Disqualification on ground of defection does not apply in case of merger of political parties. A party may merged with another or the two may form a new party. If 2/3rds of the members of the legislature party decide to merge will another party, neither the 2/3rds nor the remaining 1/3rd lose membership. If 1/3rd exist as a separate group. ("Legislature party" mean members of the party in the legislature).

- The provisions of disqualification, under the Tenth Schedule, do riot apply to a member who on his election as the Speaker or the Deputy Speaker of Lok Sabha or the Deputy Chairman of Rajya Sahha, or the Chairman or the Deputy Chairman of the Legislative Council of a State or the Speaker or the Deputy Speaker of the Legislative Assembly voluntarily gives up his membership of the political party to which he belonged immediately before his election or rejoins such political party after he ceases to hold such office.

The Chairman/Speaker has been given the final authority to decide questions of disqualification of a member of a House under the provisions of the Tenth Schedule to the Constitution.

There is a category of members that has no place

in the law. The Law does not talk of consequences of expulsion of a member from the party. The ruling of the Speaker is that he should be considered 'unattached' member. He however, can not join a political party.

There is another grey area in the law. It talks of members. One becomes a member only after he is sworn in. The moot point is whether the law applies to him from the lime of the declaration of the result till he is sworn in.

With the addition of Tenth Schedule to the Constitution by the Anti-Defection Law, political parties received Constitutional recognition which they did not have earlier. They had no Constitutional identity before. Chief Whip also receives Constitutional recognition.

Over the years, it was observed that these provisions have been circumvented by the legislators to avert disqualification. The provision of split has been grossly misused to engineer multiple divisions in the party, as a result of which the defection has not been checked in the right earnest. Further it is also observed the lure of office of profit plays dominant part in the political horse-trading resulting in spate of defections and counter defections. Therefore it was outlawed in 2003 as mentioned above.

Ques. 3 : Examine how 91st Amendment Act tries to bridge the loophole in the previous anti-defection law?

Ans. The committee on Electoral Reforms (Dinesh Goswami Committee) in its report of 1990. the Law Commission of India in its 170 Report on "Reform of Electoral Laws" (1999) and tile National Commission to Review the Working of the Constitution (NCRWC) in its report of 2002 have recommended outlawing split. The NCRWC is also of the view that a defector should be penalised for his action by debarring him from holding any public office as a Minister or any other remunerative political post for at least the duration of the remaining term of the existing Legislature or until, the next fresh elections whichever is earlier. The NOWC has also observed that abnormally large Councils of Ministers were being constituted by various Governments at Centre and States and this practice had be prohibited by law and that a ceiling on the number of Ministers in a State or the Union Government be fixed In the light of the above, the 93rd Amendment Act was made with the following changes.

- Split is not valid
- Article 361 A was amended to the following effect: A member disqualified for defection is disallowed to hold any remunerative political post for rest of the life of the House or till he is reelected which ever is earlier. The expression "remunerative political post" means any office that is wholly or partly owned by Government and the salary for such office is paid out of the public revenue.
- State of the Council of Ministers should not he more than 15% of the strength Lower house. Art.75 and 164 have been amended to this effect. However, in case of smaller States like Sikkim, Mizorarn and Goa having 32, 40 and 40 Members in the Legislative Assemblies respectively, a minimum strength of 12 Ministers is proposed.

¨ **KIHOTO HOLLOHAN**

In 1992, the Supreme court, in its majority judgment in Kihoto Hollohan vs Zachiliha and others, upheld the validity of the Tenth Schedule but declared as invalid paragraph 7, which excluded judicial review. The basis for nullification of Para 7 is that the Bill was not ratified by half the state legislatures which were necessary to restrict judicial review under Art.368. Doctrine of severability was applied and rest of the Act was declared valid.

In the same verdict, the apex court ruled that the Speaker/Chairman acted as a 'tribunal' while adjudicating on the issue of disqualification for defection.

The Supreme Court observed that the anti defection law strengthened democracy and the representative functions. It did not stifle the freedom of the legislators. However, the orders of the Chief Whip that are binding on the legislator pertain only to the following

- Confidence or no-confidence motion and
- On a policy matter that is a core of the party manifesto.

The limitation- is necessary for balancing the conscience of the legislator with the need to be true to the electorate.

The Kihoto verdict resulted when the anti defection was challenged as invalid for restricting the freedom of the legislators by making the directions of the Chief Whip of the party binding.

INTER STATE COUNCIL

Ques. 1 : Inter-State Council is the only constitutional body to deal with federal disputes in a comperehensive manner. Discuss?

Ans. Art. 263 reads as follows:

If at any time it appears to the President that the public interests would be served by the establishment of a Council charged with the duty of-

(a) inquiring into and advising upon disputes which may have arisen between States;

(b) investigating and discussing subjects in which some or all of the States, or the Union and one or more of the States, have a common interest; or

(c) making recommendations upon any such subject and, in particular, recommendations for the better co-ordination of policy and action with respect to that subject, it shall be lawful for the President by order to establish such a Council, and to define the nature of the duties to be performed by it and its organisation and procedure.

The Inter-State Council was set up under Article 263 of the Constitution of India by the President in 1990.

Prime Minister is the head of the ISC and the composition includes

- six Ministers of Cabinet rank in the Union Council of Ministers to be nominated by the Prime Minister
- two Ministers of Cabinet rank in the Union Council of Ministers to he nominated by the Prime Minister as permanent invitees.
- Chief Ministers of all States
- Chief Ministers of Union territories having Legislative Assemblies
- Administrators of Union territories not having Legislative Assemblies
- Governors of States under President's Rule

The following issues, as far as may be expedient, may not be brought up before the Council

- Any issue which can be resolved by discussion at the official level or at the level of Ministers between the Central Government and the State Governments concerned.
- Any issue which has to be considered or dealt with by the National Development Council, the National Integration Council , the Finance Commission, the Planning Commission or such other body or authority of a like nature as may be set up from time to time to deal with specific subjects relating to Centre-State relations.
- Any issue which is currently under consideration or discussion in either House of Parliament or which is sub-judice.

Any issue relating to a matter which, under the Constitution, is left or the decision of a specified authority other than the Central Government such as the Election Commission or the Supreme Court etc

Any other issue the discussion of which may, in the opinion of the Chairman, create discord between the States or otherwise be against the public interest or against the interests of the sovereignty or integrity of India, the security of the State, friendly relations with foreign State or Public Order.

Any issue which relates to the discharge of any duty or special responsibility of the Union under the provisions of the Constitution or any law of Parliament.

The Council in its first meeting in 1990 had considered the recommendations made by the Sarkaria Commission on Centre-State Relations. Keeping in view the complexities of the issues involved and their wider implications, the Council set up a Subcommittee of the Council to examine the recommendations. The Council broadly endorsed the recommendations of the Sarkaria Commission as finalised by the Subcommittee. The Inter-State Council decided to set up

a Standing Committee for having continuous consultation and processing of all matters for consideration of the Inter-State Council. Accordingly the Standing Committee was set up in 1996.

The Inter-State Council held nine meetings so far and has taken important decisions on 171 of the 247 recommendations of the Sarkaria Commission. The last meeting 9th - was held in 2005 and discussed good governance. Some of the major decisions of the Council are a follows

- approved the Alternative Scheme of Devolution of Share in Central Taxes to States
- The Council decided that on the subject of delay in State Bills referred for President's consideration, there should be time-bound clearance of Bills referred. Also, The Bills should not be reserved for President's consideration in a routine manner.
- Laid down norms for the use of Art.356
- Discussed residuary powers of taxation, Art.355 rye
- In the 9th meet in 2005, discussed good governance.

ISC is the only Constitutional body to deal with federal disputes in a comprehensive manner. Finance Commission deals with only financial matters in the federal field. Supreme Court adjudicates on federal matters (Art. 131). Inter state water disputes tribunals exclusively deal with only water disputes.

Ques. 2 : The working of the Inter-state Council has highlighted the need for additional bodies to assist ISC in dealing with increasing member of centre-state disputes?

Ans. The then Prime Minister, Shri Jawaharla1 Nehru convened the National Integration Conference in 1961 to find ways and means to combat the evils of communalism, casteism, regionalism linguism and similar social evils. This conference decided to set tip a National Integration Council (NIC) to review all matters pertaining to national integration and to make recommendations thereon.

The NIC held 12 meeting so far. Issues relating to National Integration and Communal Harmony in the context of Kashmir and Punjab problem and dispute over Ram Janam Boomi-Babri Masjid, problem of Regionalism and Communalism, role of Educational Institutions and Mass Media and responsibility of the Press, etc. were discussed in the various meetings of NIC.

The NIC functions as a forum for effective initiative and interaction on issues of national concern, review issues relating to national integration and make recommendations.

National Integration Council was reconstituted in 2005. It has 103 members. Besides Union Ministers, Chief Ministers and political leaders, the NIC will have representation from various categories such as national commissions, media persons, business, eminent public figures and women.

The NIC (2008) has 11 Cabinet Ministers, and leaders of all major political parties

Leaders of regional political parties have also been nominated. The reconstituted body also has the chairpersons of the National Commission for Minorities, the National Commission for Scheduled Castes, the National Commission for Scheduled Tribes, the National Commission for Women and the National Human Rights Commission.

Representatives of business are also members like Ratan Tata, Rahul Bajaj, N. R. Narayana Murthy and Kiran Mazumdar Shaw.

Among the 36 public figures named on the NIC are Mrinal Sen, M.S. Swarninathan and Ram Jethrnalani.

Media persons and women's representatives are also among the members.

¨ Zonal Councils

The idea of creation of Zonal Councils was mooted by the first Prime Minister of India, Pandit Jawahar Lal Nehru in 1956 when during the course of debate on the report of the States Re-organisation Commission. He suggested that the States proposed to be reorganised may be grouped into four or five zones having an Advisory Council "to develop cooperative working" among these States. This suggestion was made - by Pandit Nehru at a time when linguistic reorganization led to bitterness and hostilities. As a

remedy to this situation, it was suggested that a high level advisory forum should be set up resolve common problems and to create healthy inter-State and Centre-State environment and fostering balanced socio economic development of the respective zones. There are five zonal councils.

- The Northern Zonal Council, comprising the States of Haryana, Himachal Pradesh, Jarunni & Kashinir, Punjab, Rajasthan, NCT of Delhi and U.T of Chandigarh;
- The Central Zonal Council, comprising the States of Chhatisgarh, Uttaranchal, Uttar Pradesh and Madhya Pradesh;
- The Eastern Zonal Council, comprising the States of Bihar, Jharkhand, Orissa, Sikkirn and West Bengal;
- The Western Zonal Council, comprising the States of Goa, Gujarat, Maharashtra and the Union Territories of Daman & Diu and Dadra & Nagar Haveli; and
- The Southern Zonal Council, comprising the States of Andhra Pradesh, Karnataka, Kerala, Tamil Nadu and the Union Territory of Pondicherry.

The seven North Eastern States i.e (i) Assam (ii) Arunachal Pradesh (iii) Manipur (iv) Tripura (v) Mizoram (vi) Meghalaya and (vii) Nagaland are not included in the Zonal Councils and their special problems are looked after by the North Eastern Council, set up under the North Eastern Council Act, 1972. Sikkim was added to them later.

The Zonal Council for each zone consists of the following members

- the Chief Minister of each of the States included in the zone and two other Ministers of each such State nominated by the Governor;
- where any Union Territory is included in the zone, two members from each such territory nominated by the President;

Further the Zonal Council for each zone has the following persons as Advisers to assist the Council in the performance of its duties

- one person nominated by the Planning Commission
- Chief Secretaries of the States included in the Zone
- Development Commissioners of States included, in the zone.

The union home minister is the chairman .of each of these councils. The Chief Ministers of the States included in each zone act as Vice Chairman of the Zonal Council for that zone by rotation, each holding office for a period of one year at a time. Union Ministers are also invited to participate in the meetings of the Zonal Councils depending upon necessity.

Each Zonal Council has setup a Standing Committee consisting of Chief Secretaries of the member States of their respective Zonal Councils. These Standing Committees meet from time to time to resolve the issues or to do necessary ground work for further meetings of the Zonal Councils. Senior Officers of the Planning Commission and other Central Ministries are also associated with the meetings depending upon necessity.

The Secretariat explores centre-State, inter-State and zonal issues which are to the deliberated by the Councils or the Standing Committees.

The main objectives of setting up of Zonal Councils are as under:-

- national integration
- balancing regionalism with federalism
- Enabling the Centre and the States to co-operate and exchange ideas and experiences; and
- Establishing a climate of co-operation amongst the States for successful and speedy execution of development projects.

Broadly these Councils are expected to :

- Promote a cooperative approach to facilitate economic and social planning and the execution of development schemes particularly inter-State projects;
- Deal with matters arising out of the re-organisation of States such as border problems, integration of services, linguistic minorities, inter-State transport, roads, etc;
- Initiate measures of common interest

in the field of social and economic planning, and exchange experience available with each State to the best common advantage;

- Tackle common law and order problems and devise uniform policies regarding administration of civil and criminal law; and
- Deal with common problems like floods, drought, scarcity, local cess, etc.

Zonal Councils provide a forum where irritants between Centre and States and amongst States can be resolved through discussions and consultations. Though there are a large number of other fora like the National Development Council, inter State Council, Governor's/Chief Minister's Conference add other periodical high level conferences held under the auspices of the Union Government, the Zonal Councils are different, both in content and character. They are regional fora of cooperative, endeavour for States linked with each other economically, politically and culturally. Being small and high level bodies, specially meant for looking after the interests of respective zones they are capable of focusing attention on specific issues taking into account regional factors while keeping the national perspective in view.

The scope of functions of these Zonal Councils is very wide, as they can discuss any matter in which some or all of the States represented in that Council, or the Union and one or more of the States represented in that Council, have a common interest. These Councils have been set up with the objective to provide a common meeting ground in each zone for ensuring resolution of Inter-State problems, fostering balanced regional development and building harmonious Centre-State Relations.

ENVIRONMENT & ECOLOGY

BIODIVERSITY

NAGOYA PROTOCOL

The Nagoya Protocol on Access & Benefit Sharing (ABS) was adopted on 29 October 2010 in Nagoya, Japan and will enter into force 90 days after the fiftieth instrument of ratification. Its objective is the fair and equitable sharing of benefits arising from the utilization of genetic resources, thereby contributing to the conservation and sustainable use of biodiversity.

Objectives

The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization (ABS) to the Convention on Biological Diversity is a supplementary agreement to the Convention on Biological Diversity. It provides a transparent legal framework for the effective implementation of one of the three objectives of the CBD: the fair and equitable sharing of benefits arising out of the utilization of genetic resources.

Relevance

The Nagoya Protocol is intended to create greater legal certainty and transparency for both providers and users of genetic resources by:

- Establishing more predictable conditions for access to genetic resources.
- Helping to ensure benefit-sharing when genetic resources leave the contracting party providing the genetic resources

By helping to ensure benefit-sharing, the Nagoya Protocol creates incentives to conserve and sustainably use genetic resources, and therefore enhances the contribution of biodiversity to development and human well-being.

Scope

The Nagoya Protocol applies to genetic resources that are covered by the CBD, and to the benefits arising from their utilization. The Nagoya Protocol also covers traditional knowledge (TK) associated with genetic resources that are covered by the CBD and the benefits arising from its utilization

Obligations

The Nagoya Protocol sets out core obligations for its contracting Parties to take measures in relation to access to genetic resources, benefit-sharing and compliance.

Access Obligations

Domestic-level access measures are to:

- Create legal certainty, clarity and transparency
- Provide fair and non-arbitrary rules and procedures
- Establish clear rules and procedures for prior informed consent and mutually agreed terms
- Provide for issuance of a permit or equivalent when access is granted
- Create conditions to promote and encourage research contributing to biodiversity conservation and sustain-able use
- Pay due regard to cases of present or imminent emergencies that threaten human, animal or plant health
- Consider the importance of genetic resources for food and agriculture for food security

Benefit-sharing Obligations

Domestic-level benefit-sharing measures are to provide for the fair and equitable sharing of benefits arising from the utilization of genetic resources with the contracting party providing genetic resources. Utilization includes research and development on the genetic or biochemical composition of genetic resources, as well as subsequent applications and commercialization. Sharing is subject to mutually agreed terms. Benefits may be monetary or non-monetary such as royalties and the sharing of research results.

Compliance obligations

Specific obligations to support compliance with the domestic legislation or regulatory requirements of the contracting party providing genetic resources, and contractual obligations reflected in mutually agreed terms, are a significant innovation of the Nagoya Protocol. Contracting Parties are to:

- Take measures providing that genetic resources utilized within their jurisdiction have been accessed in accordance with prior informed consent, and that mutually agreed terms have been established, as required by another contracting party
- Cooperate in cases of alleged violation of another contracting party's require-ments
- Encourage contractual provisions on dispute resolution in mutually agreed terms
- Ensure an opportunity is available to seek recourse under their legal systems when disputes arise from mutually agreed terms
- Take measures regarding access to justice
- Take measures to monitor the utilization of genetic resources after they leave a country including by designating effective checkpoints at any stage of the value-chain: research, development, innovation, pre-commercialization or commercialization.

Implementation

The Nagoya Protocol's success will require effective implementation at the domestic level. A range of tools and mechanisms provided by the Nagoya Protocol will assist contracting Parties including:

- Establishing national focal points (NFPs) and competent national authorities (CNAs) to serve as contact points for information, grant access or cooperate on issues of compliance
- An Access and Benefit-sharing Clearing-House to share information, such as domestic regulatory ABS requirements or information on NFPs and CNAs
- Capacity-building to support key aspects of implementation. Based on a country's self-assessment of national needs and priorities, this can include capacity to
- Develop domestic ABS legislation to implement the Nagoya Protocol
- Negotiate MAT
- Develop in-country research capability and institutions
- Awareness-raising
- Technology Transfer
- Targeted financial support for capacity-building and development initiatives through the Nagoya *Protocol's financial mechanism, the Global Environment Facility (GEF).

THE CONVENTION ON BIOLOGICAL DIVERSITY (CBD),

Known informally as the Biodiversity Convention, is an international legally binding treaty. The Convention has three main goals:

1. conservation of biological diversity (or biodiversity);
2. sustainable use of its components; and
3. fair and equitable sharing of benefits arising from genetic resources

In other words, its objective is to develop national strategies for the conservation and sustainable use of biological diversity. It is often seen as the makes clear that products from new technologies must be based on the precautionary principle and allow developing nations to balance public health against economic benefits. It will for example let countries ban imports of a genetically modified organism if they feel there is

not enough scientific evidence the product is safe and requires exporters to label shipments containinggenetically modified commodities such as corn or cotton. The required number of 50 instruments of ratification/accession/approval/acceptance by countries was reached in May 2003. In accordance with the provisions of its Article 37, the Protocol entered into force on 11 September 2003.

Global Strategy for Plant Conservation

In April 2002, the parties of the UN CBD adopted the recommendations of the Gran Canaria Declaration Calling for a Global Plant Conservation Strategy, and adopted a 16 point plan aiming to slow the rate of plant extinctions around the world by 2010.

International Bodies Established by the Convention

Conference of the Parties (COP): The convention's governing body is the Conference of the Parties (COP), consisting of all governments (and regional economic integration organizations) that have ratified the treaty. This ultimate authority reviews progress under the Convention, identifies new priorities, and sets work plans for members. The COP can also make amendments to the Convention, create expert advisory bodies, review progress reports by member nations, and collaborate with other international organizations and agreements.

The Conference of the Parties uses expertise and support from several other bodies that are established by the Convention. In addition to committees or mechanisms established on an ad hoc basis, two main organs are:

Secretariat: The CBD Secretariat. Based in Montreal, it operates under the United Nations Environment Programme. Its main functions are to organize meetings, draft documents, assist member governments in the implementation of the programme of work, coordinate with other international organizations, and collect and disseminate information.

Subsidiary body for Scientific, Technical and Technological Advice (SBSTTA): The Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA). The SBSTTA is a committee composed of experts from member governments competent in relevant fields. It plays a key role in making recommendations to the COP on scientific and technical issues. 13th Meeting of the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA-13) held from 18 to 22 February 2008 in the Food and Agriculture Organization at Rome, Italy. SBSTTA-13 delegates met in the Committee of the Whole in the morning to finalize and adopt recommendations on the in-depth reviews of the work programmes on agricultural and forest biodiversity and SBSTTA's modus operandi for the consideration of new and emerging issues. The closing plenary convened in the afternoon to adopt recommendations on inland waters biodiversity, marine biodiversity, invasive alienspecies and biodiversity and climate change. The current chairperson of the SBSTTA is Dr. Senka Barudanovic.

ENVIRONMENT MOVEMENT

1997: RIO+5 CONFERENCE, NEW YORK

The Rio+5 Conference was the first comprehensive status review of work to implement the UNCED's agreements. This Conference aimed to revive and strengthen commitment to sustainable development, ascertain failures and identify the reasons in each case, recognize achievements, set priorities and determine problems that had not been addressed sufficiently in Rio. The description of sustainable development in Agenda 21 called for a total shift in the status quo of prevalent value systems and institutional processes. Such global change could never have occurred over night. When progress was assessed at Rio+5 (New York, 1997) a number of gaps were identified, particularly with regards to social equity and poverty. This was largely reflected by falling levels of official development assistance (ODA) and growing international debt along with failures to improve technology transfer, capacity building for participation and development, institutional coordination, and reduce excessive levels of production and consum-ption. The review meeting called for the ratification, reinforcement and stronger implementation of the growing number of international agreements and conventions which refer to environment and development. In the prepartory process in the lead up to the conferece a multi-stakeholder consultation took place.

JOHANNESBURG SUMMIT 2002

What is Joannesburg Summit 2002?

Johannesburg Summit 2002 – the World Summit on Sustainable Development – brought together tens of thousands of participants, including heads of State and Government, national delegates and leaders from non-governmental organizations (NGOs), businesses and other major groups to focus the world's attention and direct action toward meeting difficult challenges, including improving people's lives and conserving our natural resources in a world that is growing in population, with ever-increasing demands for food, water, shelter, sanitation, energy, health services and economic security.

Why Now?

At the 1992 Earth Summit in Rio, the international community adopted Agenda 21, an unprecedented global plan of action for sustainable development. But the best strategies are only as good as their implemen-tation. Ten years later, the Johannesburg Summit presents an exciting opportunity for today's leaders to adopt concrete steps and identify quantifiable targets for better implementing Agenda 21.

When & Where Was it?

The Summit took place in Johannesburg, South Africa from 26 August to 4 September 2002. The Summit was held in the Sandton Convention Centre, just outside Johannesburg. A non-governmental forum took place at the nearby NASREC Centre and numerous other parallel events also took place around Johannesburg at the same time.

Who Went?

Broad participation and inclusiveness are key to the success of sustainable development. All sectors of society have a role to play in building a future in which global resources are protected, and prosperity and health are within reach for all of the world's citizens. Therefore, in addition to governments, there was active participation at the Summit by representatives from business and industry, children and youth, farmers, indigenous people, local authorities, non-governmental organizations, scientific and technological communities, women and workers and trade unions. These represent the Major Groups identified in Agenda 21.

Side Events

Side events are events that take place in the margins of official inter-governmental meetings, organised for the purpose of sharing experiences and increasing opportunities for dialogue among the official meeting's participants. A number of side events coordinated by the UN was held during the Preparatory Committee (PrepCom) meetings inside the Sandton Convention Centre throughout the Summit itself.

Parallel Events

Around the time of the Summit, a number of additional events - known as parallel events - took place in the Johannesburg area. These events were convened and managed by organisations or groups that are independent of the United Nations. The Johannesburg World Summit Company (JOWSCO) - a non-profit company that is wholly owned by the South African government and which managed logistical operations on behalf of the Summit's host nation — coordinated logistics for these parallel events. Click here for more information on parallel events.

Who Organised the Summit?

The tenth session of the UN Commission on Sustainable Development (known as CSD10) acted as the Preparatory Committee for the Summit which was the central organising body. CSD10 had four preparatory meetings for the Summit during 2001-2002, known as PrepComs. These meetings were held as follows:

- CSD10 sessions were steered by a Bureau which consisted of 2 representatives from each region of the world (10 members in total). The Bureau for CSD10 guided the process and raised political awareness and support for the Summit amongst member governments and major groups.

Secretary General's Advisory Panel

The Secretary-General of the United Nations, Kofi Annan, convened a Panel of Eminent Persons to explore the challenges of sustainable development and make recommendations to him for meeting them through the Summit process. The Secretary-General asked Panel members to help raise political awareness of the Summit process, both generally and within their own individual spheres of influence and impact.

Logistics

Logistical organization of the Summit within South Africa was managed by the Johannesburg World Sum-

mit Company (JOWSCO), on behalf of the Government of South Africa.

Greening the Summit

Since the Summit was the biggest international gathering ever held in Africa, the "Greening the WSSD" Initiative was establi-shed to ensure that the Summit was organized along environmental "best practice" lines and that minimal waste was generated by the thousands of delegates that descended on Johannesburg.

COPENHAGEN CLIMATE COUNCIL (2007) AND SUMMIT(2009)

The Copenhagen Climate Council is a global collaboration between international business and science founded by the leading independent think tank in Scandinavia, Monday Morning, based in Copenhagen. The councilors of the Copenhagen Climate Council have come together to create global awareness of the importance of the UN Climate Summit (COP15) in Copenhagen, December 2009, and to ensure technical and public support and assistance to global decision makers when agreeing on a new climate treaty to replace the Kyoto Protocol from 1997.

Organization

The Copenhagen Climate Council was founded in 2007 by the leading independent think tank in Scandinavia, Monday Morning, head-quartered in Copenhagen, Denmark.

Purpose

The purpose of the Copenhagen Climate Council is to create global awareness of the importance of the UN Climate Summit (COP15) in Copenhagen, December 2009. Leading up to this pivotal UN meeting, the Copenhagen Climate Council works on presenting innovative yet achievable solutions to climate change, as well as assess what is required to make a new global treaty effective. The Council will seek to promote constructive dialogue between government and business, so that when the world's political leaders and negotiators meet in Copenhagen, they will do so armed with the very best arguments for establishing a treaty that can be supported by global business. By promoting and demons-trating innovative, positive, and meaningful business leadership and ideas, the Copenhagen Climate Council aims to demonstrate that achieving an effective global climate treaty is not only possible, but necessary. The strategy is built upon the following principles:

- Creating international awareness of the importance of the Copenhagen UN Climate Summit and the successor treaty to the Kyoto Protocol.
- Promoting constructive dialogue between government, business, and science.
- Inspiring global business leaders by demonstrating that tackling climate change also has the potential to create huge opportunities for innovation and economic growth.

Manifesto

Published in November 2007, on the eve of the UN COP13 Climate Change Conference in Bali – the instigation night of the Bali Road Map. The document outlines what the Council believes is required to tackle climate change and how this can be achieved through a new global treaty. The Manifesto articulates a clear goal for the maximum level of greenhouse gases in the atmosphere by 2050. The document will serve as input at the World Business Summit on Climate Change, outlining key elements for further discussion and inclusion in the recommendations to be delivered to the UN Summit.

Membership

Copenhagen Climate Council comprises 30 global climate leaders representing business, science, and public policy from all parts of the world.

- Business leaders are selected to represent global companies and innovative entrepreneurs, who, through their actions, reveal that sustainable, climate-responsible business is both necessary and profitable.
- Scientists are gathered to ensure that the work of the Council is underpinned by rigorous analysis.
- Policy makers with experience in public policy are included in the Council to ensure that the work is informed by knowledge of what is required to assist high-level, complex policy negotiations.

Activities

The central aim of the Copenhagen Climate Council is to create global awareness to the urgency

of reaching a global agreement on how to tackle climate change at the UN Climate Conference in Copenhagen, December 2009. To achieve this end, the Copenhagen Climate Council provides a Web 2.0 climate website – 'The Climate Community' – which features latest climate news, intelligence, solutions and points of view, an online climate community, as well as the rest of the Copenhagen Climate Council activities, such as the 'World Business Summit on Climate Change'; launching the 'Thought Leadership Series'; launching the 'Climate LIFE' film, book, and digital exhibition; co-hosting with CITRIS the scientific conference 'Unlocking the Climate Code: Innovation in Climate and Energy'; and the Poznan side event 'Business Requirements of a Post-2012 Climate Treaty'. Recently, the Copenhagen Climate Council has also hosted a Business Roundtable in Beijing.

The Climate Community

The Climate Community is the official website of the Copenhagen Climate Council. The website is based on Web 2.0 principles, and hooks the user up with the worlds leading climate stakeholdersand offers possibility for the user to give voice and influence the global climate agenda. The Climate Community aims to bring the latest and most relevant news, insights, and intelligence that equips the user to navigate the climate challenges and turn risks into opportunities. The Climate Community features an extensive news section with Top Stories, Daily News Summaries, Points of Views, and a Weekly Roundup, searchable by date, region and sector.

Exclusive news features so far include interviews with U.S. Energy Secretary Steve Chu, UN Climate Chief Yvo de Boer, the Danish Climate minister Connie Hedegaard, IPCC Chairman Rajendra Pachauri, Professor Daniel Kammen, Lars Josefsson, CEO of Vattenfall. The Climate Community also features regular updates on the COP15 negotiation process and important upcoming events. The unique content on Community also includes selected and in-depth descriptions of innovative business solutions. A valuable feature on the Community is the Climate Intelligence Archive, which selects and list key international policies, research reports, government agencies, NGOs, inspiring media sources, and upcoming climate events.

The Climate Community also hosts an online Virtual Summit, which is an integral part of the World Business Summit on Climate Change to take place in May 2009. The Virtual Summit will facilitate knowledge sharing and collaboration, as well as be a testing ground for new ideas and partnerships through interactive web 2.0 tools.

World Business Summit on Climate Change

The World Business Summit on Climate Change takes place six months prior to the pivotal UN climate change conference (COP15) in Copenhagen, December 2009. The summit brings together business chief executives with the world's top scientists, economists, civil society, media leaders, government represen-tatives and other leading thinkers to put forward recommendations for the next intern-ational framework on climate change to replace the Kyoto Protocol after 2012. Among the prominent participants so far are Al Gore, Chairman of Generation Investment Manage-ment; Anders Fogh Rasmussen, Prime Minister of Denmark; and Sir Richard Branson, Founder and CEO of the Virgin Group.

At the summit, chief executives will discuss how business can help solve the climate crisis through innovative business models, new partnerships and the development of low carbon technologies. They will send a message to the negotiating governments on how to remove barriers and create incentives for implementation of new solutions in a post-Kyoto. The results of the World Business Summit on Climate Change will be presented to the Danish government, host of COP15[2], and to world leaders negotiating the terms of the next international climate treaty.

Thought Leadership Series

The Copenhagen Climate Council Thought Leadership Series on Climate Change is a publication that will be published in hardcopy and on the Copenhagen Climate Council Home Page in the lead up to the World Business Summit on Climate Change in May 2009. The Thought Leadership Series presents a collection of inspirational, concise and clearly argued pieces from some of the world's most renowned thinkers and business leaders on climate change. The objective of the pieces is to assist in enhancing the public and political awareness of the actions that could have a significant impact on global emissions growth and to

disseminate the message that it is time to act hence a new UN climate treaty will be developed in December 2009. The Thought Leadership Series is aimed at elucidating and creating awareness of the key elements in the business and policy response to the climate problem. The rationale for the Thought Leadership Series is firstly to change the focus from stating we have a problem to communi-cating the solutions to the problem, and secondly to show the potential and opportunities inherent in tackling climate change. The themes of the Thought Leadership series are:

- Tackling Emissions Growth: The Role of Markets and Government Regulation
- Achieving low emissions energy systems in rapidly developing economies
- Drawing down CO2 from the atmosphere
- The role of city planning and buildings in tackling emissions growth
- Achieving the capital investment required to tackle climate change
- The CEO's survival guide to climate change
- Adapting to the impacts of climate change
- Role of Information and Communications Technology in Addressing Climate Change
- Beyond a global agreement: Scenarios from the future

Climate LIFE

Climate LIFE is a film, book and digital exbition project initiated by the Copenhagen Climate Council. Climate LIFE is intended to be "a virtual tour of how communities across the globe can both fight climate change and adapt to a warming world". The purpose of Climate LIFE is to encourage awareness of and appreciation for the human and commercial potential in a low carbon future. The Copenhagen Climate Council With hopes for Climate LIFE to act as a catalyst for a new public discourse on climate change.

FILM : "Climate LIFE - the 5th revolution"

Climate LIFE - the 5th revolution is an "emotional and strong story" of a journey across the world in search of the solutions so urgently needed for avoiding a world climate life gone a wreck. It is produced in the realisation that we need a new climate agenda in order to achieve a transition to a sustainable society. The Copenhagen Climate Council has stated it is "necessary" to tell the story of climate change using a new positive language that can appeal to new audiences. Particularly, the Copenhagen Climate Council wishes to use "evocative and emotional storytelling" to get behind the real motivations, which has made pioneers, community leaders and others act on climate changes. Through compelling and evocative story-telling, the audiences will themselves feel the urgency of the quest and be inspired to take action. Climate LIFE will be a follow-up to Al Gore's 'An inconvenient truth'. Where Al Gore opened the world's eyes to the massiveness of climate change, Climate LIFE intends to tell the new convenient truth of climate change - that the knowledge and solutions we know today give us the opportunity to create communities that enhance quality of life; that it is possible to build a greener, safer and more sustainable Earth. Climate Life - the 5th revolution aims to show that the precondition for the success is already present. A short feature will be launched at the World Business Summit on Climate Change and subsequently it will be shown at events, on the web, and will also be distributed to TV broadcasters across the world. The film is produced in collaboration with Koncern Film and TV.

The LIFE Digital Exhibition

The LIFE digital Exhibition is intended to demonstrate what makes Climate LIFE possible. When launched on the web, it will explore the delivery model necessary to achieve the vision of Climate LIFE. Looking at the political, economic and cultural systems as well as the technological and biological process that will underpin low carbon living in the future, the exhibition will present a variety of practical solutions and their implications, highlighting the state of the art in movement, energy production and efficient consumption, water and waste management etc. The exhibition aims to use the latest social software advances and interactive tools to illustrate the challenges, how they affect people, and the possibilities for getting involved.

Unlocking the Climate Code: Innovation in Climate and Energy

On June 19, 2008, Copenhagen Climate Council and Center for Information Technology Research in the Interest of Society (CITRIS) co-hosted an energy conference named Unlocking the Climate Code: Innovation in Climate and Energy. The aim of the conference was to identify the critical research and development achievements necessary for a successful transition to a low carbon economy. Conference participants will present and debate relevant policy and business models that can support technology innovation in carbon emissions reduction. In an effort to create models of the relationships in business, policy, and technology to help guide innovative and rational decision making at the 2009 UN Summit, a suite of tools was developed, better known as the Climate Navigator. According to Gary Baldwin, Director of Special Projects at CITRIS, the Climate Navigator will have several interrelated parts and functions. It will serve as an Internet-based community forum for researchers, policy makers, and business leaders, allowing politicians and others to direct questions to experts or open on-line discussions about specific proposals. It will also be a digital library, organizing the growing base of knowledge about how business models and policy can influence technology. In addition, the Navigator will employ new technology itself, including computer modeling applications developed by Dan Kammen's lab at Berkeley.

Business Requirements of a Post-2012 Climate Treaty

On December 8, 2008, the Copenhagen Climate Council hosted an official side event at the UN COP14 Summit on Climate Change in Poznan, Poland from December 1-10, 2008. The theme wasBusiness Requirements to a Post-2012 Climate Treaty. At the event, Council representatives from business and science presented their key principles for a new treaty. The thoughts presented at the event will feed into the development of the final recommendations delivered by international business leaders at the World Business Summit on Climate Change, to be held in Copenhagen in May, 2009.

The speakers delivered their views on what they would toast to in Copenhagen. They included: Copenhagen Climate Council Chairman Tim Flannery; Robert Purves from World Wildlife FundInternational; Jerry Stokes, president of Suntech Europe; Dr. Zhengrong Shi, Founder and CEO of Suntech; Steve Harper of Intel; Susanne Stormer from Novo Nordisk; Michael Zarin of Vestas; and Thomas Becker, the lead climate negotiator for the Danish government that will host the UN COP15 climate summit in December, 2009. The session was moderated by Nick Rowley, strategic director at Copenhagen Climate Council.

Business Roundtable in Beijing

On November 11, 2008, the Copenhagen Climate Council hosted a roundtable meeting with some of the most prominent business leaders in China and the Danish Minister for Climate and EnergyConnie Hedegaard. According to the Copenhagen Climate Council, conclusion of the summit was clear: "Climate change is becoming an important issue for Chinese CEOs, and opportunities in energy-efficient products and renewable energy are a driver for change."

"Chinese business leaders recognize that sustainable development is a corporate responsibility, and that the need for creating economic growth in China should meet the needs of sound environment protection. I encourage all industries to respond and to collaborate – hand in hand – on tackling the challenge. I want to make sure that our children can live on a beautiful planet with blue sky and clean air. We are dedicated to this," said Li Xiaolin, chairwoman and CEO of China Power International, one of Chinas five-biggest energy suppliers.

BALI ACTION

BALI ACTION PLAN (BAP) After the 2007 United Nations Climate Change Conference on the island Bali in Indonesia in December, 2007 the participating nations adopted the Bali Road Map as a two-year process to finalizing a binding agreement in 2009 in Copenhagen. The conference encompassed meetings of several bodies, including the 13th Conference of the Parties to the United Nations Framework Convention on Climate Change (COP 13) and the 3rd Meeting of the Parties to the Kyoto Protocol (MOP 3 or CMP 3).

The Bali Road Map includes the Bali Action Plan (BAP) that was adopted by Decision 1/CP.13 of the COP-13. It also includes the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol (AWG-KP) negotiations

and their 2009 deadline, the launch of the Adaptation Fund, the scope and content of the Article 9 review of the Kyoto Protocol, as well as decisions on technology transfer and on reducing emissions from deforestation.

Bali Action Plan

Pillars

The Conference of Parties decided to launch a comprehensive process to enable the implementation of the Convention through long-term cooperative action, now, up to and beyond 2012, by addressing: (the called pillars or building blocks)

- A shared vision for long-term cooperative action, including a long-term global goal for emission reductions.
- Enhanced national/international action on mitigation of climate change.
- Enhanced action on adaptation.
- Enhanced action on technology development and transfer to support action on mitigation and adaptation.
- Enhanced action on the provision of financial resources and investment to support action on mitigation and adaptation and technology cooperation.

Cutting Emissions

The nations acknowledge that evidence for global warming is unequivocal, and that humans must reduce emissions to reduce the risks of "severe climate change impacts" and emphasized the urgency to address climate change. There was a strong consensus for updated changes for both developed and developing countries. Although there were not specific numbers agreed upon in order to cut emissions, the Decision recognized that there was a need for "deep cuts in global emissions" (plural countries proposed 100% reduction in 2050) and that "developed country emissions must fall 10-40% by 2020".

Mitigation

Enhanced action on mitigation of climate change includes, inter alia:

- Nationally appropriate mitigation commitments or actions by all developed countries.
- Nationally appropriate mitigation actions (NAMAs) by developing countries.
- Cooperative sectorial approaches and sector-specific actions (CSAs).
- Ways to strengthen the catalytic role of the convention.

Forests

The nations pledge "policy approaches and positive incentives" on issues relating to reducing emissions from deforestation and forest degradation (REDD) in developing countries; and enhancement offorest carbon stock in developing countries This paragraph is referred to as "REDD-plus".

Adaptation

The nations opt for enhanced co-operation to "support urgent implementation" of measures to protect poorer countries against climate change, including NAPAs. impacts.

Technology

In technology development and transfer, the nations will consider how to facilitate the transfer of clean and renewable energy technologies from industrialised nations to the developing countries.This includes, inter alia:

- Removal of obstacles to, an provision of financial and other incentives for, scaling up the development and transfer of technology to developing country Parties in order to promote access to affordable environmentally sound technologies (renewable energies, electric vehicles).
- Ways to accelerate the deployment, diffussion and transfer of such technologies.
- Cooperation on research and development of current, new and innovative technology, including win-win solutions.
- The effectiveness of mechanism and tools for technology cooperation in specific sectors.

Finance

Provision of financial resources and investment includes:

- Improved access to predictable and sustainable financial resources and the provision of new and additional resources, including official and concessional funding for developing country Parties (dcP).

- Positive incentives for dcP for national mitigation strategies and adaptation action.

- Innovative means of funding for dcP that are particularly vulnerable to the adverse impacts of climate change in meeting the costs of adaptation.

- Incentivisation of adaptation actions on the basis of sustainable development policies.

- Mobilization of funding and investment, including facilitation of climate-friendly investment choices.

- Financial and technical support for capacity-building in the assessment of costs of adaptation in developing countries, to aid in determining their financial needs.

Ad Hoc Working Groups

The Conference decided establish a subsidiary bodies under the Convention to conduct the process, the Ad Hoc Working Group on Long-term Cooperative Action (AWG-LCA) and the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol (AWG-KP), that were to complete their work in 2009 and present the outcome to the COP15/MOP 5. The Group must develop its working programme in its first session in a coherent and integrated manner.

The AWG-LCA and AWG-KP presented draft conclusions to COP15 and CMP5, which contained many unresolved issues. These working groups are now due to report to COP16 and CMP6 in Mexico.

Timescales

Four major UNFCCC meetings to implement the Bali Road Map were planned for 2008, with the first to be held in either March or April and the second in June, with the third in either August or September followed by a major meeting in Poznan, Poland in December 2008. The negotiations process was scheduled to conclude at the United Nations Climate Change Conference 2009 in Copenhagen, Denmark.

Durban CONFERENCE

THE 2011 UNITED NATIONS CLIMATE CHANGE CONFERENCE was held in Durban, South Africa, from 28 November to 11 December 2011 to establish a new treaty to limit carbon emissions. The conference agreed to a legally binding deal comprising all countries, which will be prepared by 2015, and to take effect in 2020. There was also progress regarding the creation of a Green Climate Fund (GCF) for which a management framework was adopted. The fund is to distribute US$100 billion per year to help poor countries adapt to climate impacts. While the president of the conference, Maite Nkoana-Mashabane, declared it a success, scientists and environmental groups warned that the deal was not sufficient to avoid global warming beyond 2 °C as more urgent action is needed.

Background

The conference was officially referred to as the 17th session of the Conference of the Parties (COP 17) to the United Nations Framework Convention on Climate Change (UNFCCC) and the 7th session of the Conference of the Parties serving as the meeting of the Parties (CMP 7) to the Kyoto Protocol. In addition, the two permanent subsidiary bodies of the UNFCCC – the Subsidiary Body for Scientific and Technological Advice (SBSTA) and the Subsidiary Body for Implementation (SBI) – were likely to hold their 35th sessions. The 2010 United Nations Climate Change Conference extended the mandates of the two temporary subsidiary bodies – the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol (AWG-KP) and the Ad Hoc Working Group on Long-term Cooperative Action under the Convention (AWG-LCA) – so they were expected to meet as well.

A primary focus of the conference was to secure a global climate agreement as the Kyoto Protocol's first commitment period (2008–2012) was about to end. It was also expected to focus on "finalising at least some of the Cancun Agreements", reached at the 2010 Conference, such as "co-operation onclean technology", as well as "forest protection, adaptation

to climate impacts, and finance – the promised transfer of funds from rich countries to poor in order to help them protect forests, adapt to climate impacts, and "green" their economies".

A month before the Conference began, the BBC highlighted two contentious proposals which had been submitted – one by Russia, the other by Papua New Guinea, both aiming to amend the United Nations Framework Convention on Climate Change. Russia's proposal would bring about a "periodic review" whereby countries currently categorised as "poor" could be recategorised as "rich", and thus obliged to shoulder greater obligations in the combat against climate change. BBC Environ-ment correspondent Richard Black commented that the proposal would be "provocative and explosive, if Russia pushes it", because potentially affected countries, such as China and Brazil, would "push back very strongly". Papua New Guinea's proposal, submitted by Ambassador Kevin Conrad with the support ofMexico, would introduce a "last resort" mechanism to break any deadlocks in climate change negotiations through a three-quarters majority vote, thus clarifying the decision-making process under the Conven-tion. Describing the proposal as "intriguing", Black noted that although it would theoretically enable developing countries to use their numerical superiority to adopt any kind of world-wide binding obligation, in practical terms they would still need the approval of rich countries to secure funding.

IPCC

The Intergovernmental Panel on Climate Change (IPCC) warned in November 2011 that extreme weather will strike as climate change takes hold. Heavier rainfall, storms and droughts can cost billions and destroy lives. Estimates suggest that every dollar invested in adaptation to climate change could save $60 in damages.

India

India's representative at the conference, Jayanthi Natarajan stated that India "will never be intimidated by any threat or pressure". Natarajan responded to European Union Climate Commissioner Connie Hedegaard, saying that: We have shown more flexibility than virtually any other country. But equity is the centrepiece, it cannot be shifted. This is not about India. Does fighting climate change mean we have to give up on equity? We have agreed to protocol and legal instrument. What's the problem in having one more option? India will never be intimidated by any threat or any kind of pressure. What's this legal instrument? How do I give a blank cheque? We're talking of livelihoods and sustainability here. I'm not accusing anybody, but there are efforts to shift the (climate) problem to countries that have not contributed to it. If that is done, we're willing to reopen the entire Durban Package. We did not issue a threat. But are we being made into a scapegoat? Please don't hold us hostage.

People's Republic of China

Xie Zhenhua, head of the Chinese delegation, stated that the People's Republic of China was willing to make binding commit-ments to limited greenhouse gases in 2020 if they appropriately took into account historical contributions of greenhouse gases by developed countries such as the United States and European states and sustainable economic needs of developing countries such as China and India.

Greenpeace

Greenpeace issued a statement calling on conference participants to ensure a peak in global emissions by 2015, continue the Kyoto Protocol and provide a mandate for a comprehensive legally binding instrument, deliver climate finance and set up a framework for protecting forests in developing countries.

Durban Platform

After two weeks of negotiations a deal was reached only on the last day, Sunday 11 December, after a 60-hour marathon negotiation session. Negotiators agreed to be part of a legally binding treaty to address global warming. The terms of the future treaty are to be defined by 2015 and become effective in 2020. The agreement, referred to as the "Durban platform", is notable in that for the first time it includes developing countries such as China and India, as well as the US which refused to sign the Kyoto Protocol. The agreement entails the continuation of the Kyoto protocol in the interim, although only some countries including members of the EU are likely to commit.

Green Fund

The conference led to progress regarding the

creation of a Green Climate Fund for which a management framework was adopted. The fund is to distribute US$100bn per year to help poor countries adapt to climate impacts.

Responses

After the conference concluded, Michael Jacobs of the Grantham Research Institute on Climate Change and the Environment in London, said: "The agreement here has not in itself taken us off the 4 °C path we are on... But by forcing countries for the first time to admit that their current policies are inadequate and must be strengthened by 2015, it has snatched 2 °C from the jaws of impossibility. At the same time it has re-established the principle that climate change should be tackled through international law, not national, voluntarism."

Christiana Figueres, executive secretary of the UN Framework Convention on Climate Change said: "I salute the countries who made this agreement. They have all laid aside some cherished objectives of their own to meet a common purpose, a long-term solution to climate change."

Kumi Naidoo of Greenpeace International said: "Right now the global climate regime amounts to nothing more than a voluntary deal that's put off for a decade. This could take us over the 2 °C threshold where we pass from danger to potential catastrophe."

U.S. Senator Jim Inhofe, who opposes government energy regulations such as cap-and-trade and has called man-made climate change a hoax, cheered what he called the setting aside of "any remote possibility of a UN global warming treaty" and described the conference outcome as "the complete collapse of the global warming movement and the failure of the Kyoto process". Inhofe said that the message from Washington, including from President Obama and the Democratic leadership of the U.S. Senate, to the delegates of the conference was that they are being ignored. German media criticised the outcome as "almost useless", saying the pledges are vague and the timeline is slow, the main merit being that the talks have been kept alive.

2010 UNITED NATIONS CLIMATE CHANGE CONFERENCE

The 2010 United Nations Climate Change Conference was held in Cancún, Mexico, from 29 November to 10 December 2010. The conference is officially referred to as the 16th session of the Conference of the Parties (COP 16) to the United Nations Framework Convention on Climate Change (UNFCCC) and the 6th session of the Conference of the Parties serving as the meeting of the Parties (CMP 6) to the Kyoto Protocol. In addition, the two permanent subsidiary bodies of the UNFCCC – the Subsidiary Body for Scientific and Technological Advice (SBSTA) and the Subsidiary Body for Implementation (SBI)– held their 33rd sessions. The 2009 United Nations Climate Change Conference extended the mandates of the two temporary subsidiary bodies, the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol (AWG-KP) and the Ad Hoc Working Group on Long-term Cooperative Action under the Convention (AWG-LCA), and they met as well.

Background

Following the non-binding Copenhagen Accord put forth in 2009, international expectations for the COP16 conference were reduced. Four preparatory rounds of negotiations (i.e. sessions of the AWG-KP and the AWG-LCA) were held during 2010. The first three of these were in Bonn, Germany, from 9 to 11 April, 1 to 11 June (in conjunction with the 32nd sessions of SBSTA and SBI), and 2 to 6 August. The Bonn talks were reported as ending in failure. The fourth round of talks in Tianjin, China, made minimal progress and was marked by a clash between the US and China.The Ambo declaration was adopted at the Tarawa Climate Change Conference on the 10th November 2010 by Australia, Brazil, China, Cuba, Fiji, Japan, Kiribati, Maldives, Marshall Islands, New Zealand, Solomon Islands and Tonga. It calls for more and immediate action, and was slated to be presented at COP 16.

Expectations

In August 2010, Ban Ki-moon stated that he doubted whether member states would reach a "globally agreed, comprehensive deal," suggesting instead that incremental steps might come. After the Tianjin talks in October Christiana Figueres, executive secretary of the UN Framework Convention on Climate Change (UNFCCC), said, "This week has got us

closer to a structured set of decisions that can be agreed in Cancun ... This is the greatest societal and economic transformation that the world has ever seen." Other commen-tators spoke of a positive spirit of negotiation and of paving the way for agreement in Cancun.

Outcome

The outcome of the summit was an agreement adopted by the states' parties that called for a large "Green Climate Fund", and a "Climate Technology Centre" and network. It looked forward to a second commitment period for the Kyoto Protocol.

The agreement recognizes that climate change represents an urgent and potentially irreversible threat to human societies and the planet, which needs to be urgently addressed by all Parties. It affirms that climate change is one of the greatest challenges of our time and that all Parties must share a vision for long-term cooperative action in order to achieve the objective of the Convention, including through achievement of a global goal. It recognizes that warming of the climate system is scientifically based and that most of the observed increase in global average temperatures since the mid twentieth century are very likely due to the observed increase in anthropogenic greenhouse gas concentrations, as assessed by the IPCC in its Fourth Assessment Report.

The agreement further recognizes that deep cuts in global greenhouse gas emissions are required, with a view to reducing global greenhouse gas emissions so as to hold the increase in global average temperature below 2°C above pre-industrial levels, and that Parties should take urgent action to meet this long-term goal, consistent with science and on the basis of equity; and recognizes the need to consider, in the context of the first review, strengthening in relation to a global average temperature rise of 1.5°C. The agreement also notes that addressing climate change requires a paradigm shift towards building a low-carbon society. The agreement calls on rich countries to reduce their greenhouse gas emissions as pledged in the Copenhagen Accord, and for developing countries to plan to reduce their emissions. The agreement includes a "Green Climate Fund," proposed to be worth $100 billion a year by 2020, to assist poorer countries in financing emission reductions and adaptation. There was no agreement on how to extend the Kyoto Protocol, or how the $100 billion a year for the Green Climate Fund will be raised, or whether developing countries should have binding emissions reductions or whether rich countries would have to reduce emissions first. Reuters Environment Correspondent Alister Doyle reported that to most delegates, though they approved it, the agreement "fell woefully short of action needed."

The New York Times described the agreement as being both a "major step forward" given that international negotiations had stumbled in recent years, and as being "fairly modest" as it did not require the changes that scientists say are needed to avoid dangerous climate change. John Vidal, writing in The Guardian, criticised the Cancun agreements for not providing leadership, for not specifying how the proposed climate fund will be financed, and for not stating that countries had to "peak" their emissions within 10 years and then rapidly reduce them for there to be any chance to avert warming. Also criticised were the deferral of decisions on the legal form of and level of emission reductions required. A 40-nation "transition committee" was to meet by the end of March 2011, but it was deferred until late April amid squabbles among Latin American countries and the Asia bloc about who should be on the committee. The committee is due to present a complete plan for the fund by the next climate conference in South Africa starting in November, 2011.

Adaptation

It decides to establish the Cancun Adaptation Framework and the Adaptation Committee, invites Parties to strengthen and, where necessary, establish regional adaptation centres and networks and notes that an international centre to enhance adaptation research and coordination could also be established in a developing country.

Mitigation

- Developed countries should submit annual greenhouse gas inventories and inventory reports and biennial reports on their progress.
- Agrees that developing country Parties will take nationally appropriate mitigation actions in the context of sustainable development, supported and enabled by technology, financing and

capacity-building, aimed at achieving a deviation in emissions relative to "business as usual" emissions in 2020. It decides to set up a registry to record nationally appropriate mitigation actions seeking international support and to facilitate matching of finance, technology and capacity-building support to these actions. Once support has been provided they are called internationally supported mitigation actions (ISMAs), that will be subject to international measurement, reporting and verification.

Finance

It takes note of the collective commitment by developed countries to provide new and additional resources, including forestry and investments through international institu-tions, approaching USD 30 billion for the period 2010–-2012 and recognizes that developed country Parties commit, in the context of meaningful mitigation actions and trans-parency on implementation, to a goal of mobi-lizing jointly USD 100 billion per year by 2020 to address the needs of developing countries.

It decides to establish a Green Climate Fund, to be designated as an operating entity of the financial mechanism of the Convention. Also decides that the Fund shall be governed by a board of 24 members; the trustee shall administer the assets of the Green Climate Fund only for the purpose of, and in accordance with, the relevant decisions of the Green Climate Fund Board.

The conference establishes a Standing Committee under the Conference of the Parties to assist the Conference of the Parties in exercising its functions with respect to the financial mechanism

Technology

In technology development and transfer, decides to establish a Technology Mechanism, which will consist of a Technology Executive Committee and a Climate Technology Centre and Network. The Climate Technology Centre and Network and the Technology Executive Committee shall relate so as to promote coherence and synergy. The Technology Executive Committee shall further implement the framework of the Convention (technology transfer framework) and Committee shall comprise 20 expert members. The Climate Technology Centre shall facilitate a Network of national, regional, sectoral and international technology networks, organi-zations and initiatives

Capacity-building

It reaffirms that capacity-building is essential to enable developing country Parties to participate fully in addressing the climate change challenges, and to implement effectively their commitments under the Convention.

Ques. 17 : Briefly discuss the features of Indian Music?

Ans. Originally, in India there was only one system of music, but during the medieval period the North India came under the impact of the diverse musical influences of the Islamic world-particularly Persian, which led to the division of the Indian Music into two distinct schools the Hindustani (North Indian) and Karnataka (South Indian). But the basic features in both schools of music were common. The Indian music is of two types Marga-Sangit (mystical) and Desi Sangit (secular). The cause of music is pleasant sound termed in India "Nada". Indian music is divided into "Ragas" or melody-types. There are ten major "Ragas" or parent scales of which the most important are Yaman, Bilawata Khamaj, Bhairava, Purvi, Marwa, Kafi, Asawari, Bhairavi and Todi. The major Ragas or parent scales are further sub-divided into Ragas and Raginis so that we have about 200 types of melodies. Each Raga must have five notes, one principal one (called Vadi), one second important note (called Samvadi) and the rest assistant notes (called Anuvadi), Ragas are sung in various speeds and some move in a certain pitch. Music has also its rhythmic beats which are divided into 'tala', 'laya' and 'matra'. 'Tala is a complete cycle of a metrical phrase composed of a fixed number of beats. 'Laya' is tempo-slow, medium, fast. 'Matra' is the smallest unit of the 'Tala'.

Thus the gamut of several notes woven into a composition may be called a 'Raga'. The Ragas can be sung without any instrumental accompaniment but generally take 'Tabla' (drim) for the purpose besides any stringed instrument. They are sung at particular seasons and time of the day or night.

Beginning in the 13th century, with the establishment of Delhi Sultanate Islamic hegemony in the north is commonly believed to be associated with evolution of two distinct styles of musical practice in India. The Hindustani of north and the Karnataka of the south. Although the Hindustani system considered different from the Karnataka by virtue of presence of Persian and Turkish features in the former- musicians from Persia and central Asia were associated with courts in the North at least until the late seventeenth century.

Today the two main classical styles in India correspond geographically the linguistic areas of Indo-Aryan based languages in the north and Dravidian based languages in the south. Although analytically both can be considered two variants of one underlying system, the two systems are considered in India to distinct constituting separate theory systems, histories, composition and performers.

Common to both systems are the fundamental concepts of pitch (svara) melody type (raga known as rag in the north and ragam in the south) and meter (tala, tal in the north and talam in the south). Both also use similar, types of performance ensembles with a vocalist or instrumentalist as soloist, a drummer as rhythmic accompanist and a drone provided by a tanpura. In the case of vocal soloist, a melodic accompanist on an instrument is also present.

Ques. 18 : Write short notes on;

A) Hindustani Music

B) Karnataka Music

C) Principal Indian Ragas

D) Indian Musical Instruments

Ans. Hindustani music is usually traced back by its practitioners to the Delhi Sultanate period with Amir Khusrau (1253-1325 A.D.) as one of the earliest historical personalities. Although traditionally considered the inventor of the sitar and tabla, and as well as several ragas and other musical genres, the actual evidence for these assumptions is not clear.

The Zenith of Hindustani music is associated with the great Tansen, one of the jewels of the court of the Mughal emperor, Akbar, (1556-1605). A vocalist and an instrumentalist, most Hindustani today trace their muscial descent from Tansen.

Hindustani musical performance is based on a composition which is set to a meter and from which extemporised variations are generated. The composi-

tion is usually a relatively short tune which is said to embody the essence of the rag (mode or melody type) in which it is composed.

A performance begins with an alap. For dhrupad (four part composition) and in instrumental genres, the alap is elaborate and characterised by the absence of any metered accompaniment. Following the alap, pulsed sections, which are considered subsectors of the alap, are performed in dhrupad and instrumental genres and are called for (instrumental) or nom-tom (dhrupad). Sitar and Sarod performance practice also includes a jhala, which is an alternating pulsed and melodic section often repeated within the composition itself later in the performance. In the voval khayal the alap is typically non-existent or short and sometimes extended into the metered section.

Once the alap is ended the composition proper is performed. The composition is set to a recurring rhythmic cycle (tala).

Hindustani vocal music is performed in three major and several minor styles. The oldest and most austere is a four part composition known as dhrupad. The main classical vocal form today is the two part composition known as khayal (pers, imagination), usually followed at the end of a concert by a light classical form known as thumri.

Texts of most compositions are devotional, although these can take on a remarkably wide range of manifestations ranging from abstractly spiritual to the highly erotic.

Most instrumental compositions in the north (referred to as gat), although sometimes based on vocal models are a largely separate repertoire in the north and are performed mainly on either the sitar or the sarod. They include compositions which are inherited through family lineages along with more recent compositions. In this century several other instruments including the flute, sarangi and shahnai have also developed solo performance traditions.

¨ **KARNATAK MUSIC**

What is performed today as Karnatak music is derived most immediately from three outstanding composers of the eighteenth century, known collectively as the Trinity: Thyagaraja (1759-1847); Svami Shastri (1763-1827) and Dikshitar (1775-1835). The Trinity, although not themselves patronized by the courts, spent most of their lives within a few miles radius of Tanjore, which became the focal point of musical patronage in the south after the fall of Vijayanagar (1585). Thyagaraja is revered both as the supreme artist and a saint, and epitonizes the ideal of musicianship in the south. Most of his immediate disciples were not professional musicians but devotees and is only after the succedding generation that professional musicians received Thavagaraja's compositions.

Karnataka performance practice tends to give greater emphasis to the actual composition than is the case for Hindustani music. The fixed and memorized composition along with its memorized variations are longer and constitute proportionately much more a given performance than in the north.

Karnataka music include three major performance genres as well as some minor ones: the varnam as advanced etude-like composition of ten performed as the first item of a performance. The kriti, which is the classical compositional form most often associated with the eighteenth century Trinity, is devotional in its textual material, and the ragam-tangam-pallavi a somewhat more abstract musical form embodying extensive unmetered sections along with a new or borrowed compositional line characterized by rhythmic variation in the pallavi section. The ragamtenam-pallavi is in principle the centerpiece of a Karnatak performance, although a kriti will often assume this role in actual practice.

Despite the series of contacts one can make between the two systems they share analogous structural units. For example, the Karnatak alspana is in many respects equivalent to the Hindustani alap; both function as the expositional structure of a raga.

¨ ***Principal Indian Ragas***

Indian classical music consists of six principal Ragas and thirty Raginis. Music is adapted to the season of the year, hours of the day and mood of the performer. The Indian year is divided into six seasons and each season has its own Raga. The principal Ragas are Bhairav, Hindol, Megha, Sriraga, Deepak and Malkaus. According to Indian concept of Music, each Raga is a demigod, wedded to five Raginis. Thus there are six Ragas and thirty Raginis. The day is divided into six parts, and each is allotted to a particular Raga. Thus Bhairavi Raga is usually sung from 4 a.m. to 8 a.m. Hindol from 8 a.m. to 12 noon. Megha from 12 noon to 4 p.m. Sriraga from 4 p.m. to 8 p.m. Deepak

from 8 p.m. to 12 midnight and Malkaus from 12 midnight to 4 a.m.

¨ ***Indian Musical Instruments***

The principal Indian musical instrument as may be divided into tour classes : (i) stringed instruments, which have strings made of steel, copper or brass wires or silken cords. Such instruments are veena, sarod, sitar, tanpura, rabbad: (ii) instruments played with bow, such as sarangi, dilruba, mayuri etc., (iii) drum instruments, which are played with bands on sticks, such as pakhawaj, tabla, naggara, dholak etc., and (iv) wind or mouth instruments, which are played by blowing full or half breaths, such as, flute, bin, surna etc.

Ques. 19: Explain the chief characteristics of the following classical dances; Bharat-Natyam, Kuchipudi, Kathakali, Kathak, Manipuri and Odissi?

Ans. Dancing is one of the most ancient arts in Indian culture. From as early as the Vedic times, it established its root in the Indian soil, being deeply associated with religious rites, representing the supposed performances of the gods and goddesses themselves, and maintaining the divine and spiritual concepts of the race. Aesthetic values were inherent in the styles, modes and forms of dance. The religious purpose being diverse, the styles of dance were equally varied. In course of time secular dancing also came to establish itself, But as an art, it could not be taken lightly. The artists, male or female, had to undergo rigorous training to be well versed in the rules and formalities of any style of dance. The Indian classical dances are not easy discipline, but through the ages they have retained their vigour owing to the devotion of the gurus and their disciples.

(i) Bharat-Natyam

One of the most ancient forms of dance art is Bhyarat-natyam, with its origins in an unbounded faith in God, and having the purpose of conveying to the human mind the virtues of purity coupled with an admiration for aesthetic values. Bharata-natyam combined within itself poetry and music, dance and acting, in order to express itself to the outer world in its fullness. The dance flourished in Tamil Nadu, and its influence extended over a wide area of the South. During the second half of the nineteenth century when the British sway and the Western influence over Tamil Nadu were complete. Bharata-natyam passed through its most critical period. It was about to be lost and forgotten. But one of the descendants of the Tanjore brothers Meenakshi Sundaram Pillai, would not allow the art to die. He maintained the art traditions in their pure from and bequeathed them to the future.

In its usual form, the dance is generally broken into seven man parts Alarippu, Jatiswara, Shabda, Varna, Pada, Tillana and Sloka, Alarippu signifies the beginning of the dance in simple poses and movements with a short invocation to the gods. It gives an opportunity to the dancer to make the body and limbs ready for the performance. The Jatiswara ushers in the real dance in which the movements of the body are synchronized with the swara of the raga and the tala. The dance in its most actue form and the abhinaya for an elaborate expression are performed alternatively and then in a combined form. The feet play according to the jatis, the hands and fingers perform the mudras, and the face expresses the inner feeling. The whole performance is set into the raga, tala and bhava. The Tillana is the dance in its most exquisite form, sublime and beautiful when the dance exhibits the bodily poses in superb styles. The fast item of the Bharata-natyam is the Sloka, with which the dance closes.

No dance has or could have remained in a changeless form since the time of its origin. Bharata-natyam too has changed its scope and contents at different times according to new needs. In the thirties of the twentieth century, Rukmini Devi Arundale, a champion of Bharata-natyam, brought about radical changes in the constumes of the dancers. From the ancient sculptures depicting the dance styles, ideas regarding classical costumes were formed and adopted. Simultaneously, many outmoded, heavy and difficult dresses were abandoned to make the dance easier. Make-up of a modern nature was used to make the dancer's person more attractive. In the promotion of the cause of Bharata-natyam in modern times, E. Krishna lyer and Rukmini Devi have played remarkable roles.

(ii) Kuchipudi

Among the old forms of the south Indian dance, Kuchipudi has survived with distinct characteristics of its own and has attracted wide attention in modern times. Though its origin was from the dance-dramas of very ancient times, it individuality as a separate style dates back to the days of the Bhakti movements. It

depicted Krishna's life through music and drama to carry the devotional appeal to the heart to man. Thus like the Bhagavat Mela Natak of Tamil Nadu, a kind of dance-drama emerged in the Andhra Desha which became famous as Kuchipudi. The name has no relation to the dance itself, at it is derived from place-Kuchipudi in Krishna district of Andhra Pradesh where the dance flourished.

The Kuchipudi dance consists of a few divisions such as Adavus, Jatis, Jatiswaras, Trimanas and Tillanas. The dance also expresses itself through padas, varnas, shabads and slokas. These features are also found in Bharata-natyam. But one very distinct feature of the Kuchipudi dance is Karnnakole which is not to be found in any other southern dance style. It is the superb, quick and rhythmic footwork of the dancer. The Kuchipudi singers who accompany the dance know Sanskrit and Telugu. The music of the dance is Karnatic. In its modern developoment, the Kuchipudi dance-drama has been changing its character with a greater tendency towards solo itmes. The credit goes to Lakshmi Narayan Shastri for having brought renown to the Kuchipudi dance during the present century.

(iii) Kathakali

Kathakali is the classical dance of Kerala, with its origins in remote antiquity, and has been developed through an admixture of Dravidian and Aryan dance concepts. The Nairs of Kerala, who formed a warrior caste, practised martial dances in order to perpetuate in society the memory of their racial equalities. In the evolution of the Kathakali dance, the Nairs had a good deal to do. They developed its modes and techniques and made it a robust form of dance, at once masculine and skilful. The epics and the mythology supplied to themes for the dance in great abundance. Malayalam, with many Sanskrit words, became the language of the Kathakli songs. Vaishnavite devotional dance influences gradually expanded the scope and character of the Kathakali dance. There were several names applied to it according to the nature of the dance, it came to be styled as Kathakali, meaning and story-play. When the decline of Kathakali was almost complete, it was the famous Malayalam poet Vallathol Narayana Menon who struggled on to revive the art at all costs. With much difficulty he procured money and finally in 1930 established an institute named Kerala Kala Mandalam. There he collected the experienced gurus of the Kathakali art, who were living in abject negligence an in oblivion, and gave the the opportunity to train up young disciples. Kathakali takes epic mythological themes as its content and portrays them through an elaborate dramatic spectacle.

Which is characterized by an other-wordly quality, supernatural grandeur, stylized large-sized costumes to give the impression of enlarging human proportions, and mask-like facial make-up which is governed by a complex symbolism of colour, line and design. Character types, such as heroes, anti-heroes, villains, demons, snags and kings, all have a prescribed make-up and costume governed by the association of green with good, red with valor and ferocity, black with evil and primitiveness, and white with purity. Combinations of these colours suggest the exact character type and his particular mood in the play. Kathakali, however, is dance-drama and not drama because the actors do not speak their lines. The dramatic story is carried forward through a highly evolved vocabulary of body movements, hand gestures and eye movements. The vocalist recites and sings the lines of the dramatic piece. The actor on stage portrays the meaning with the freedom to improvise and interpret. While, therefore, he follows the broad framework of the written dramatic script which is being sung. he makes departures and deviations like dancers in any of the other styles. Similarly, mime is interspersed with pure dance sequences. During the last one hundred years, many poets have written Kathakali plays which represent as much a literary genre as a theatrical spectacle. In technique, Kathakali follows the basic motif on a rectangular position reminiscent of a full grand-pile with the important difference that the weight of the body rests on the outer soles of the feet and not on the flat feet.

Kathakali is spectacular as regards the costume and make-up. There are trained artists who specialise in the art of make-up. Different characters of the play are painted in different colours of styles, to represent the satwik, rajasik, and tamasik roles. The head-dress in Kathakali is again of gorgeous and artistically decorative style. Ornaments, also are lavishly used.

(iv) Kathak

Kathak means 'the story of teller'. Finally, with the coming of Islam in the middle ages, mystic traits slowly entered into the fold of Kathak. The medieval

Bhakti movement among the Hindus and the Sufi movement among the Muslims gave poetry an emotional touch. The devotional feeling of the medieval Vaishnavites towards Krishna found expression in the Kathak dance which depicted the Krishna Lila in its manifold aspects. Kathak became partly secular to meet the needs of the muslim counts which did not like the Hindu religious themes. Thus, Kathak incorporated into itself certain Islamic features notably in its costumes.

Kathak from northern India is an urban sophisticated style full of virtuosity and intricate craftsmanship. Commonly identified with the court traditions of the later Nawabs of northern India, it is an amalgam of several folk-traditions, the traditional dance-drama forms prevalent in the precincts of the temples of Mathura and Vrindaban known as the Krishna and Radha Lilas, and the sophisticated court milieu of Mughal and Indian princes. While its origins are old, its present format is attributed to the genius of Nawab Vajid Ali Shah (died 1887) of Awadh and the hereditary musician-dancer Pandit Thakar Prasadji. Its contemporary repertoire was evolved by a few families of traditional dancers over the past hundred years. In technique, Kathak is two dimensional, always following a vertical line with no breaks and deflections. The footwork is the most important part of the dancers' training. They are taught numerous rhythmic patterns with varying emphasis so that the hundred old ankle bells can produce a fantastic range of sound and rhythm. Straight walks, gliding movements, fast pinoucttes changing tempos and matrical patterns constitute the beauty and dexterity of the style. As in other dance forms, the Kathak performer begins with an invocation (amad) and entry (salam) followed by an exposition of slow delicate movements of the eyebrows, eyes, lateral neck and shoulders. Next comes to presentation of rhythmic patterns known as tukras and toras. Time cycles can be repeated, adding complexity to the presentation, Pirouettes, arranged in groups of three, six, nine, twelve and so on, normally mark the finale. The pure dance sections are followed by short interpretative pieces performed to a repetitive melodic line.

There were already two styles of Kathak prevailing in the north- the Jaipur style and the Lucknow style. Both the Jaipur and Lucknow styles lingered on through the latter half of the nineteenth and the first quarter of the twentieth century till they were revived again. The revival of Kathak in modern times began with the zeal of an individual the famous Menaka who wanted to establish an institute for training the dancers in classical Kathak style. She herself received training from the experienced gurus available, and in 1938 established a school for training others at a place called Khandala.

The fame of Kathak spread far and wide as the dance was performed at different places. Gurus like Lachhu Maharaj, Shambhu Maharaj and Birju Maharaj established Kathak as a dance art of great merit. Kathak has a number of advantages. It has a simpler and at the same time appealing style. Its costumes are diverse and varied, but changeable, and they are far from being complicated and difficult. It is easy to follow the bhava expressed in the dance, as it is attractive to follow the melodies. The grace and majesty of the dance, coupled with its aesthetic, make it pleasant from beginning to end.

The Kathak music, developed from the styles of religious chants presents melody and rhythm is a nice combination. The dancer dances to the tala according to matras. His or her footwork. Known as the tatkar, is the distinctive feature of the dance performed at slow, medium and fast speeds.

(v) Manipuri

From legendary times the beautiful valley of Manipur in the far away north-eastern region of India maintained as indigenous dance style of its own known as Manipuri. The history of the origin of this art is shrouded in mystery, though there is plenty of evidence to show that at from very early times the people of Manipur loved dance and music and prided themselves as the descendants of the Gandharvas. By the eighteenth century, the Bhakti cult was deeply rooted in Manipur and, patronized by the ruling princes, it became a popular from of religion. The traditional dance and music of the area came under the influence of the new cult and adjusted itself to the spirit of the times. The credit for reviving and systematizing the dance of the soil goes to King Bhagyachandra who became the ruler of Manipur in 1764. The King's whole hearted encouragement to music and dance finally culminated in the revival of the Manipuri dance. The poses, their variations and movements of the body in the Manipur system were codified.

It was in the early years of the twentieth century that the Manipur captured the attention of Rabindra

Nath Tagore. The mode of the dance, the melody of the music, the emotions represented and the artistic value of the performances all appealed to Tagore's imagination in a profound sense. At Santiniketan he initiated the study and performance of Manipuri till the art was restored to its original value. That was the beginning of the modern phase in the history of the Manipur dance. Tagore gave his touch of vitality to Manipuri to keep it abrest of the times. He supplied themes for the dance-dramas in Manipuri technique, and his Rabindra Sangeet made the dance especially charming in many respects.

In technique, Manipuri is quite different from Bharata-natyam and Odissi Feet are in front, not out-turned, knees are relaxed, slightly bent forward but not flexed sideways; there is no out-turned position of the things. The torse is relaxed with the upper chest and wrist moving in opposition. The whole body is turned into an immaginary figure of eight or similar to the English letter 'S'. The arms moves as a unit, with no sharp angles. The fingers of the hands also move in circles, semi-circles and curves, gradually folding and unfolding. The primary unit of movement s known as the chali or the pureng on which the dance is built. Five different types of ballet, with well conceived structuring of corps de ballet and solo pas de deux revolving around the theme of Radha, Krishna and the Gopis (milkmaids), comprise the large part of the classical repertoire of Manipur. The second group of dances are known as the Sankritanas. They follow a more vigorous technique with jumps and elevations but no leg extensions, and are performed generally by men to typical Manipur drums (pung), cymbals (kurtals) and clapping. A large variety of intricate rhythmic patterns are played on these instruments. The Nata Sankirtana often precedes the Rasa. Throughout there is an alternation of pure dance and mime, the latter most restrained and refined.

The ritual dances of Manipur are a group apart: the most significant among them are the Maiba and Maibi dances of priests and priestesses before village deities. They often culminate in trances. Lal Haroba, for instance, is spread over many days; its ritual patter is rigorous and different sections all fall into a dexterous patter of floor choreography and physical movement performed to a repetitive melody on a bowed instrument called the pena. The main dancers are Khamba and Thoibi, supposedly counterparts of Shiva and Parvati. There are two distinct forms of the movement, generally defined as the lasya and the tandav. The lasya calls for an easy movement of the limbs, restricted to the natural bonds within which they can move freely without any forced stretch in any direction. The tandav aspect requires more difficult and vigorous movements of the body when the limbs are stretched beyond the natural orbits. Also where are numerous poses, postures, and gestures, all expressive of the fundamental meanings of the art.

On the musical side, the drums, flute, horns, esraj, tamboura, cymbals, and mridang are some of the important instruments. The costume of the Manipuri dance is graceful and charming. The long skirt, the overskirt and the blouse all gorgeously embroidered; and the numerous varieties of beautiful ornaments, highlight the dancer's personality, especially in the case of female dancers.

(vi) Odissi

Odissi, the classical dance art of Orissa, has had a vivid but variegated history. The devdasis became the real exponents of the Odissi dance, patronized by the Orissa monarchs and with inspiration from the great saint-poet like Jayadev. The hundreds of Konark dancing-girls in stone have preserved the Odissi dance in its most refined and lively form. The code of rules, as well as the dancing poses in illustrated forms have been preserved in the body of the old palm leaf manuscripts of Orissa.

The revival of Odissi after independence took place in a phenomenal way. The credit goes to one of the foremost exponents of drama, dance and music of modern Orissa, Kabichandra Kallicharan Patnaik.

The chief characteristic of the Odissi style is to represent dance in a chaste and simple form through beautiful body postures, artistically oriented body bends, and rhythmic movements. Within the main principles, the classical dance, such as the bhava, raga and tala, the Odissi dancer performs the natya, combining in it the elements of dancing and acting. The dance begins with the Bhumi Pranam or salutation to the Mother Earth. Next begins the Vighnaraja Puja in which a sloka is recited while the dancer starts dancing. The dancer expresses the mood of the song through artistic poses and movements of the eys, and next per-

forms a piece of pure dance. In the next item, called Abhinaya Nritya of Gita-abhinaya, the dancer carries the performance towards the climax Romantic themes on Krishna and Radha are depicted with utmost skill in dance and expression. As the dance comes to a close, the dancer pays the final salutation to the Mother Earth, the gods and the guru in a reverential mood. From the beginning till the end, the Odissi dance maintains its religio-ritualistic character.

The costume of Odissi is related to the graceful elegance of the dance. The silk and patta sari in bright colours and the Kandhula or blouse in a deeper shade with embroidery work set off by decorative ornaments for the head, neck, arms and feet form the main features of the Odissi costume.

Ques. 20 : Give a brief description of the miscellaneous dances of India?

Ans. There are interesting performances, with highly artistic values and arduously developed disciplines, surviving in different parts of the country under indigenous conditions. One such system is the Chhau Dance of Mayurbhanj and Saraikala. Chau is a dance which is exclusively performed by men. Originated from Seraikela, a former princely state in Orissa, now in Bihar, this dance form follows certain fundamental traditions of the classical modes. It is dedicated to the twin aspects of Shiva and Shakti. It is a dance of festival which culminates in a three-day ceremonial worship in the Shiva temple to be followed by a grand procession. They interpret mythology, sacred history, legend and nature. The style is precise and vigorous comprising of intricate steps, quick turns, gliding walks and various gaits. The choreography is well thought out and impressive.

(i) Mohini Attam is one of the important forms of the classical dance tradition of Kerala, presenting a perfect mode for solo performance that incorporates lasya and tandava styles. Its technique is based on the Kathakali mode, which includes the peculiar manner of dancing with the feet and legs apart, knees greatly bent, and utilising the rhythmic syllable words in the recitation and play of the drum, with perfect synchronisation of the dancer's feet.

(ii) Krishna Attam as the name suggests, is a dance drama associated with Krishna legends. It is believed that Kathakali originated from Krishna Attam, some time in the middle of the 17th century A.D., the Zamorin King of Calicut named Mahadevan, who was a poet of distinction and a votary of Lord Krishna, composed eight dramatic lyrical plays dealing with various episodes of Krishna's life. The poet king incorporated them into an ensemble which he named as Krshna Attam.

(iii) The Bhagavata Mela dance dramas of Tamil Nadu appear to have gained importance 300 years ago. when Tirtha Narayan Yati, author of the 'Krishna Lila Tarangini' in Sanskrit, migrated from Andhra to Tanjore district. He began the Bhagvata Mela tradition on the pattern of dance drama as expounded in the 'Natya Shastra' by Bharat Muni. With these ideals before him, he composed several dance dramas and as Parijataharnam and Rukmangada. His celebrated dance drama compositions like Prahalad, Harishchandra, Usha Parinayam and Gollabhama, were not only enacted all over Tamil Nadu but they became a part of people's life. They were performed annually at the great festival dedicated to God Narsimham.

(iv) Yakshangana originated from one of the very early and indigenous musical dramas known as Bahu Nataka composed by Pakkuribi Somnath in about 1250 A.D. and portrayed in several varieties of the Shiva-lila episodes. In times, these took the form of the yakshangana plays common to many regions of India. Originally a solo performance, this form, later, developed into two and then four principal characters. Gradually it assumed the form of a regular dance drama picking up themes from my theology and legend.

Ques. 21 : Briefly discuss the chief characteristics of folk dances?

Ans. Whereas classical dances tend to be subject to a definite order and a complicated system of gesture languages, footwork and body movements, folk dance is generally much more spontaneous. Its

primary impulse in rhythm; its roots lie in religious and seasonal festivals, and dance it is often guided by songs glorifying nature, expressing traditional occupations and offering devotion to deities. The vast majority of folk dances are performed by groups of people, usually consisting of either men or women. Certain basic dance patterns exist. These have been described in medieval Sanskrit literature and consist of the pindi (gourp), the thrinkhala (chain), lata (creeper) and bhedyaka (the separate movement of each dancer away from the group). Even more basic is the rasak or rasa, referring to a circular dance. There are two kind of rasa dance; the Talai-rasa, with rhythmic clapping of hands, and the Danda-rasa, in which each dancer marks the rhythm with a pair of stikcs. Through these dances unsupported by the written word, and established by its tremendous sociological impact, customs and tradition have been established and people's aesthetics enriched. With national consciousness for the arts growing from day-to-day many of these beautiful expressive dances are coming to urban audience and are being received with the enthusiasm and success they deserve.

Ques. 22 : Briefly discuss the folk dances of South India?

Ans. Kolattam is a dance by young girls with little lacquered sticks held in hands to celebrate the birthday of Rama. Originating from Tamil Nadu, this dance form is popular throughout India. Another variety of this dance form is popular throughout India. Another variety of this dance is known as Pinnal Kilattam accompanied with song or chorus that speak of the trapping of the sticks in rhythm, of the twinning of the strammers, of happy youth and that of happy dance.

Vasanta Attam is a dance of Spring, when the trees are in blossom and the air is crisp with the perfume of flowers, the peasants dance to celebrate the birth of nature. Palms coloured with turmeric and bodies dressed in orange saris with vivid contrasting borders, girls and young women foregather before the village deity and crown her with garlands. Little boys and girls bring mango buds and sing in chorus to the accompanishment of cymbals, hand clapse and the choluk. They sing and dance extolling mother goddess, the Earth.

Kummi dance usually takes place in Tamil Nadu during the Hindu New Year of the South which falls in January just after the Pongal festival. Groups of young girls dance with varying steps and clapping hands using their little minding steps in circles upon circles. Kummi takes several forms in Tamil Nadu. There is also a flower dance to a song that extols the beauty of many blossoms.

Ü *Dummy Horse Dance*

One of the most picturesque and interesting performance is the Dummy Horse Dance play done in rural south India near the temple towards autumn. Heavily attired in colourful costumes, dancers stand in a frame of a horse made of paper, cloth and light wood, brilliantly painted and draped. The dance lasts for hours together on wooden legs to the rhythm of music and drums. These dance-plays depict mythological stories.

Ootam Tullal is a type of pantomime akin to Kathakali. It is usually performed by a single accompanied by a singer, a drummer and a cymbal player. The pantomime interprets some of the choicest and select experts of Malayalam literature in an amazingly enchanting manner. Kaikottkkali is performed by young women and girls in Kerala. The chorus songs based on mythological stores build the crescendo of the dance in circles with slow and measured speed.

Tappatikkali is performed by young women and girls in Kerala during the festival of Lord Shiva. One of the elder women in the group commences the song and leads the dancers the others repeating what the sings and following her movements. Circling round and round and clapping their hands to the rhythm of their steps and the music, the dance mirrors the rural simplicity and the vivaciousness.

Dollu Kunitha among the perfomring folk arts of Karnataka Dollu Kunitha (Drum Dance) is outstandingly attractive and dynamic. It is a masculine dance because it is confined to males with good physique and at the same time keep the best on the hollow drum tied to his waist.

The Dollu Kunitha came down to Karnataka as a tradition of Beereswara worshipped by the Shepherd class of Karnataka. It is an inevitable religious and cultural ritual and is performed mostly by Kurubas, the devottes of Beere Devaru.

Generally, the performing troops consists of 15 to 20 persons. They stand in a circle and move as they

start beating their drums. They group into different formations and display their artistry.

Vyomalata Leather Puppet Show: Leather puppet show is popularly known as shadow play. This art is very popular in South India. The performers belong to a caste of Killekvatas who speak a Marathi dialect. They took the local Folk Dramas for their performances with their puppets. The Leather Puppets are made out of goat or dear skin. The themes are drawn from Ramayana, Mahabharatha and Shivapurana.

Veerabhadreswara Nruthya: The dance form depicts the story of Veerabhadra, the legendary minor god created by Lord Siva to teach a lesson to his father-in-law Daksha.

The costume here is traditional and colourful to depict the folk tradition. The troops consists of 15 artistes of whom eight are musicians. Veerabhadra is the central character and the others provide the ensemble effect.

Pooja Kunitha: This is a dance of worship to propitiate goddess Shakti. A frame made out of bamboo is covered with beautiful sarees. The artiste who dances carrying the frame on his hand calls for special skill in the centre of the frame the 'face' of the goddess made out of copper or some other metal can be seen. On festive days or special occasions, the artistes dance to fulfil their pledges. This dance is usually performed in front of the temple of Goddess Shakti.

It is very popular in Madhya, Bangalore and Kolar districts.

Karaga is a religious folk dance prevalent in Kolar, Bangalore, Tumkur and Mysore districts. The person who performs Karaga wears a beautiful decorated brass pot and dances with full of maneuvers.

Kumbha on the head of the dancer is a significant factor for Karaga, The Vannikula, a sect of Kshatriva community, performs Karaga dance.

Karadi Majalu is a percussion ensemble of Karnataka, traditionally performed in the Northern parts during social and religious functions and festivals to propitiate deities. The instruments used here include Karadi Vadya (drum) in accomplishment with Sanadi, Sati, Dimmu and Chaugada.

Costumes generally comprise of Kase panche, Kase Shirt, colourful turbans and similar coloured waist bands. The artistes dance to the orchestral support standing in a semi-circle with rhythmic movements.

Gorava dance of Karnataka is a religious dance performed by the devotees of Lord Mylaralinga. Mylara is a Shivite Centre situated in North Karnataka. The Goravas sing songs in their god and dance to the tune of Damaruga and Flute.

Mudalapaya Yakshagana is a dance prevalent in North and South Karnatka. The lead singer in this tradition is called Bhagavatha. He is the Guru who teaches dance and dialogue to the amateur village artistes.

The Songs which form part of the play are sung by him and the actors dance to the verses, drums and cymbals. Mudalapaya is known for its fine music vigorous dance and gorgeous costumes.

Veeragase is the symbolic presentation of heroism and volour of Veerabhadra during Daksha Yajnya of mythological lore. This is a popular folk form of Halnad in Karnataka. The exponents called "Lingada veeraru" perform with all religious fervour on festive day, especially during Shravana and Kartika.

Sporting an unsheathed sword in the right and a wooden prague of Veerabhadra on the left and, the performers display martial dance to the accompaniment of Karadi and Chammal drums.

Halakki Suggi Kunitha: This dance is performed by Halakki Vokkaligas have many folk arts of their own. Their harvest dance is well-known. They have a beautiful head gear which is very colourful. They dance to the tune of a drum called Gummate.

INDIAN GEOGRAPHY

NUCLEAR ENERGY

NUCLEAR ENERGY IN INDIA

Overview

- Nuclear energy contributes about 4.1% of power generation in India. The share of nuclear energy is expected to reach 9% by 2035
- Currently, there are 6 nuclear power plants generating about 4120 MW

Power Station	State	Type	Capacity (MW)
Kaiga	Karnataka	PHWR	660
Kakrapar	Gujarat	PHWR	440
Kalp[akka	Tamil Nadu	PHWR	440
Narora	Uttar Prdesh	PHWR	440
Rawatbhata	Rajasthan	PHWR	740
Tarapur	Maharashtra	BWR, PHWR	1400

- The largest nuclear power station in India is located in Tarapur, Maharastra. The largest research reactor is the Dhruva at the Babha Atomic Research Centre (BARC) in Mumbai
- Currently India uses two types of reactors for power production: Pressurised Heavy Water Reactor (PHWR), Boiling Water Reactor (BWR). Additionally the Prototype Fast Breeder Reactor is under experiments at the Madras Kalpakkam
- The Nuclear Power Corporation of India Ltd. (NPCIL) is the sole company authorised to set up nuclear power plants in India

Nuclear power plants in India

Nuclear power projects under construction

Power Station	State	Type	Capacity (MW)
Kaiga	Karnataka	PHWR	220
Kakrapar	Gujarat	PHWR	440
Kalp[akka	Tamil Nadu	PHWR	2000
Narora	Uttar Prdesh	PHWR	500
Rawatbhata	Rajasthan	PHWR	740
Tarapur	Maharashtra	BWR, PHWR	1400

Availability of nuclear materials

- Australia has the largest reserves of Uranium in the world. Canada, which has the second largest reserves, is the largest exporter of Uranium
- India has limited availability of Uranium reserves in the country (about 1% of world availability)
- The primary source of Uranium in India are the Jaduguda mines in Jharkhand. Uranium is extracted in the form of “Yellow Cake”
- However, Thorium is widely available in the world. Worldwide, Thorium is about three times as aboundant Uanium
- India has about 25% of the world’s reserves of Thorium

- In India, Throium is commonly found in the form of the meneral Monazite in the beach sands of Kerala and Tamil Nadu
- The waiver of restrictions on nuclear fuel supply by the Nuclear Suppliers Group in Sep 2008 has increased India's opportunities for importing nuclear fuel (esp. Uranium)
- India now has nuclear supply agreements with France (Sep 2008), the US (Sep 2008), the EU (Nov 2009), Canada (Nov 2009) and Russia (Dec 2009)

Departmemtn of Atomic Energy

- The Department of Atomic Energy (DAE) functions directly under the Prime Minister. The Department was established in 1958
- The DAE is responsible for all nuclear technology in India, including nuclear power and nuclear research
- The Atomic Energy Commission (AEC) function under the DAE. The Commission was established in 1948, but moved to the Dept. of Atomic Energy in 1958
- The Secretary, Dept. of Atomic Energy is the ex-officeio Chairman of the Atomic Energy Commission. Other members of the AEC include the Foreign Secretary and the Cabinet Secretary

India's three-stage nuclear power programme

- Due to limited availability of Ranium and the restrictions on nuclear fuel export, India has had to develop ingenious technologies to make optimal use of available minerals
- Subsequently, India has developed a three-stage programme to make use of uranium as well as thorium
- Stage II Fast Breeder Reactor: the PHWR uses Uranium as fuel and produces Plutonium-239 as a by-product
- Stage II Fast breader Reactor: uses Plutonium-239 and Thorium-239 as fuel and produces Uranium-233
- Stage III advanced Heavy Water Reactor: would use Thorium-232 and Uranium-233 as fuels. Currently under development at the BARC

GOVERNMENTAL BODIES IN NUCLEAR ENERGY

All bodies listed below function under the Department of Atomic Energy unless otherwise noted Heavy Water Board

- Established 1969, headquarters Mumbai
- Responsible for production of heavy water (D2O)
- Operates six heavy water plants in the country:
  - Kota (Rajasthan)
  - Baroda (Gujarat)
  - Hazira (Gujarat)
  - Thal (Maharashtra)
  - Talcher (Orissa)
  - Munuguru (Andhra Pradesh)
  - Tuticorin (Tamil Nadu)
- India is the world's largest manufacturer of heavy water
- India has exported heavy water to South Korea in 2002-2003

Nuclear Fuel Comlex

- Established 1971, location Hyderabad
- Responsible for enrichment and supply of nuclear fuel for all nuclear power plants in the country
- Also responsible for manufacturer of reactor core components
- The NFC processes both Uranium concentrates (for nuclear fuel) and Zirconium (for reactor

components)

Uranium Corporation of India Ltd.

- Established 1967, headquarters Singhbhum (Jharkhand)
- Responsbile for extraction and processing of uranium
- Operates five uranium mines and two processing plants
- All five uranium mines are located in Singhbum district of Jharkhand
  - Jaduguda mine - oldest mine, commissioned 1967
  - Bhatin mine
  - Narwapahar mine -0 latest mine, commissioned 1995
  - Turamdih mine
  - Banduhurang mine - only open pit uranium mine
- India produces about 300 tonnes a year of uranium

Indian Rare Earths Ltd.

- Established 1950, headquarters Mumbai
- Responsible for extraction of minerals from beach sands
- It primary responsibility is the extraction of Thrium (in the form of monazite) for use in nuclear industry
- Operates four mineral extraction units
  - Aluva (Kerala)
  - Chavara (Kerala)
  - Manavalakurichi (Tamil Nadu)
  - Chatrapur Orissa)

Bhabha Atomic Research Centre (BARC)

- Established as the Atomic Energy Establishment Trombay in 1957. Located in Mumbai
- It is India's first and primary nuclear research facility
- Site of CIRUS reactor (Canada-India-US Research)
- Developed Dhruva reactor (1958) - largest research reactor in the country

Indira Gandhi Centre for Atomic Research (IGCAR)

- Established 1971, located at Kalpakkam (near Chennai)
- Site of Fast Brreeder Test Reactor (FBTR), the first raactor in the world to use Plutonium (70%) Uranium (30%) Carbide fuel. The Plutonium for the reactor comes from spent fuel from the power plant on site
- Developed KAMINI (Kalpakkam Mini) reactor in 1996, tghe only reactor in the world that uses Uranium-233 as fuel
- Currently, construction of 500 MW Prototype Fast Breeder Reactor is under progress

Variable Energy Cyclotron Centre (VECC)

- Established 1977, located Kolkata
- Operates the first cyclotron in India
- Provides protons, deuterons, alpha particles and heavy ion beams to other institutions in the country

Institute for Plasma Research

- Established 1986, located in Gandhinagar, Gujarat
- Functions under the Department of Atomic Energy

- The IPR is involved in research of various aspects of plasma science
- It is the biggest plasma physics organisation in India
- The IPR was responsible for developing the ADITYA tokamak in 1989. A tokamak is a magnetic confinement fusion device used for thermonuclear fusion power
- The IPR is a major contributor to the International Thermonuclear Experimental Reactor (TER) in Cadarache, France. Expected to be operational by 2016, the ITER is the first large scale research incentive on nuclear fusion based power plants

TYPES OF NUCLEAR POWER REACTORS

Reactor	Fuel	Moderator	Coolant	Notes
Pressurised water reactor (PWR)	Enriched uranium	Light water (demineralised water)	Light water	PWR, BWR and Supercritical water reactors are 3 types of Light Water Reactors PWR is compact and high power and so used comonly in aircraft carriers, submarines etc PWR is the oldest, most widely used reactor for power generation. In PWR, the water is maintained at high pressure such that it does not boil even at high temperatures
Pressurised Heavy Water Reactor (PHWR)	Natural uranium	Heavy water (D2O)	Heavy water	Uses natural uneriched uranium Lower fuel costs No enrichment required Needs large quantities of fuel
Boiling water reactor (BWR)	Enriched uranium	Light water	Light water	Second most common type of reactor for power plants (after PWR) Water is allowed to boil Simple, uncomplicated design Lower risk, longer lifetime than PWR
Fast Breader Reactor (FBR	Enriched Uranium, Plutonium Also non-	No moderator	Liquid metal (usually kuqyud	Breeds fuel by producing more fissile material than it consumes Reactor core consists Sodium) of Plutonim and
fissile	Uranium 238		Uranium Reactor core is	surrounded by non-fissile Uranium - 238 which gets converted into fissile Pu-239 by captruring fast neutrons Since fast neutrons are specifically desired to bombard the U-238, no moderator is required
Advanced Heavy Water Reactor (AHWR)	Thorium	Heavy water Amorphous carbon	Bioling water	Currently under development at BARC Designed to use Thorium as fuel

CONVENTIONAL ENERGY IN INDIA

Overview

- Conventional sources of energy contribute about 67% of India's power production
- Conventional sources include coal, oil and natural gas
- Thermal energy (coal, oil, gas) is the largest energy source in India

COAL ENERGY IN INDIA

Overview

- India has the fourth largest reserves of coal in the world (behind USA, Russia and China)
- India is the world's third largest consumer and fourth largest producer of coal
- Coal mining in India began at the initiative of Governor General Warren Hastings at Raniganj (West Bengal) in 1774
- The East India Company set up M/s Sumner and Heatly for coal mining purpose
- Coal mining was nationalised in 1971 (coking coal) and 1973 (non-coking coal). Only the Tata Iron and Steel Company and Indian Iron and Steel Company were exempt
- Coal in India is under the purview of the Ministry of Coal

Important coal mines

Coal mine	Location	Operator	Notes
Singareni	Parnahita Godavari valley (Andhra Pradesh)	Singareni Collieries Company Ltd.	Jointly owneed by AP govt. (51%) and Union govt. (49%)
Neyveli	Tamil Nadu	Neyveli Lignite Corporation	
Raniganj	West Bengal	Bharat Coking Coal Limited	
Jharia	Jharkhand	Bharat Coking Coal Ltd.	Produces bituminous coal suitable for coke Most of India's coal comes Jharia Largest supplier of prime coke coal used in blast furnaces in India Jharia is famous for a coal field fire that has burnt underground for nearly a centuary.
Talcher	Orissa	Mahanadi Coalfields Ltd	
IB Valley	Sambalpur, Orissa	Nayveli Lignite Corporation Ltd.	
Korba	Chattisgarh	Southeastern Coalfields Ltd.	
Wardah	Maharashtra	Western Coalfields Ltd.	

Ultra Mega Power Projects

- Scheme launched by the government to meet National Electricity Pllicy stipulation of 'Power for All by 2012
- The Ultra Mega Power Projects (UMPP) scheme envisions adding 100,000 MW of installed capacity by 2012
- This involves construction of super large power plants each of capacity 4000 MW or more. The UMPP power plants will use coal as fuel
- The nodal agency for implementing the UMPP scheme is the Power Finance Corporation Ltd.

List of UMPP projects

Project location	State	Type of project (coal source)	Awarded to
Sasan	Madhya Pradesh	Pit-head (local)	Reliance Power
Akaltara	Chhattisgarh	Pit-head (local)	
Tilaiya	Jharkhand	Pit-head (local)	Reliance Power
Mundra	Gujarat	Coastal (imported)	Tata Power
Krishnapatnam	Andhra Pradesh	Coastal (kimported)	Reliance Power
Girye	Maharashtra	Coastal (imported)	
Tadri	Karnataka	Coastal (imported)	

Coal India Ltd. (CIL)

- Established 1975, headquarters Kolkata
- CIL is the largest coal miner in the world. It contributes about 85% of India's coal production
- Largest corporate employer and second largest employer in India (after Indian Railways)
- Second largest owner of land in India (after the India Railwys)
- Functions under the Ministry of Coal
- CIL is a Navaratna company
- CIL has successuflly bid for two coal mines in Mozambique and is in the process of formalising the process
- CIL has eight subsidiaries:
    - Central Mine Planning & Design Institute, Ranchi
    - Estern Coalifield Ltd., Asansol (West Bengal)
    - Northern Coalifields Ltd., Singrauli (Madhya Pradesh)
    - Sourtheastern Coalifields Ltd., Bilaspur (Chattisgarh)
    - Western Coalifids Ltd, Nagpur
    - Mahanadi Coalfields Ltd, Mabalpur (Orissa)
    - Central Coalields Ltd, Ranchi
    - Bharat Coking Coal Ltd, Dhanbad (Jharkhand)

Neyveli Lignite Corporation Ltd. (NCL)

- Eastablished in 1956, Headquarters Chennai
- Functions under the Ministry of Coal
- Lignite has only about 70% carbon and so produces less energy, but burns without coking and has low ash content
- The NLC operates the nation's largest open pit lignite mines
- NLC operates thermal power plants in addition to three large mines. The Neyveli Thermal Power Stations are India's first and only lignite fired thermal power stations
- The Neyveli mines are located on a huge ground water acquifer. The NLC supplies this sweet water is supplied to Chennai city

OIL AND NATURAL GAS IN INDIA

Overview

- India has total crude oil reserves of 775 million metric tonnes and natural gas reserves of 1074 billion cubic meters
- The primary sources of natural gas in India are the offshore platforms on the western coast. Other sources include onshore fields in Assam, Andhra Pradesh, Gujarat, and lesser quantities in Tamil Nadu, Tripura and Rajasthan
- The largest oil fields in India are the Bombay High offshore fields. Bombay High contributes about 38% of domestic production and 14% of national consumption
- The largest natural gas reserves have been found to be in the Krishna-Godavari basin. This discovery was made by Reliance Industries in 2002
- The largest petroleum refinery in India is located at Jamnagar (Gurarat). It is owney by Reliance Petroleum Ltd.
- The oldest petroleum refinery is at Guwahati. It was established on 1st January 1962 with assistance from Romania.
- Part of the natural gas produced in Maharashtra is fed into the HBJ national pipeline. Gas from other sources is usually used locally
- The primary markets for petroleum and natural gas in India include power generation, industrial and domestic fuels, tea plantations, and non-energy applications such as manufacture of fertilizers and petrochemicals
- The first discovery of oil in India was in Digboi, Asam in 1889
- Oil and natural gas comes under the purview of the Ministry of Petroleum and Natural Gas

Strategic petroleum reserves

- Government has decided to set up 5 million metric tonnes of crude oil reserves to ensure energy security. These strategic reserves will be in addition to existing storages at the oil companies
- These storage facilities are to be established at Mangalore, Vishakapatnam and Padam (near Udipi, Karnataka)
- Proposed strategic reserves to be unde rIndian Strategic Petroleum Reserves Ltd (ISPRL), a Special Purpose Vehicle under the Oil Industry Development Board
- The proposed sites are located in the east and west coasts so that they are readily accessible to refineries through marine route
- The strategic reserves are to be in underground rock caverns, which are considered to be the safest means of storing hydrocarbons
- The strategic crude oil reserves are expected to be operational by 2012

Important foreign exploration & production projects of Indian companies

Project	Location	Type	Executor
Rakhin	Myanmar	Natural Ggas	ONGC, GAIL
Sakhalin	Far east Russia	Oil, gas	ONGC
Tomsk	Western Siberia, Russia	Oil	ONGC
Lan Tay	Vietnam	Gas	ONGC
Farsi	Iran	Gas	ONGC, OIL, IOCL
Western Desert	Iraq	Oil	ONGC (contract to be renegotiated)

Eastern Syria	Syria	Oil	ONGC
MTPN	Congo	Oil	ONGC
North Ramadan	Egypt	Oil	ONGC
North East Mediterranean Deepwater Concession (NEMED)	Egypt	Gas	ONGC
Campos Basin	Brazil	Oil	ONGC
Mansarovar Energy Project	Colombia	Oil	ONGC
San Cristobal Project	Venezuela	Oil	ONGC
Muglad Basin	Sudan	Oil	ONGC
Greate Nile Oil Project	Sudan	Oil	ONGC
Block Shakti	Gabon		OIL, IOCL
Sirte Basin	Libya		OIL, ONGC, IOCL
Ghadames Basin	Libya		OIL, IOCL
Niger Delta	Nigeria		OIL, IOCL
Messila Basin	Yemen		OIL, IOCL

Oil and Natural Gas Corporation (ONGC)

- Established 1956, headquarters Dehradun
- The ONGC contributes 77% of India's oil production and 81% of natural gas production
- The ONGC is the highest profut making corporation in India (USD 5 billion). It also the largest Indian company in oil exploration
- ONGC Videsh Ltd (OVL) has a presence in 16 countries esp in Latin America, Africa, Middle East, CIS and the Far East
- OVL's first overseas oil exploration project was the Rostam and Raksh oil fields in Iran
- OVL's first major oil find was the LanTay and LanDo oil fields in Vietnam
- Functions under the Ministry of Petroleum and Natural Gas

Oil India Ltd. (OIL)

- OIL is Asia's oldest petroleum and natural gas company
- Established 1889, incorporated 1959. Headquarters Noida
- The predecessor of OIL made the first oil discovery in India 1889
- OIL's operations are mostly concentrated in the northeast
- Functions under the Ministry of Petroleum and Natural Gas

Gas Authority of India Ltd (GAIL)

- It is India's largest natural gas company
- Eastablished 1984, headquarters New Delhi
- GAIL commissioned the 2800 km Hazira-Vijaipur-Jagdishpur (HVJ) natural gas pipeline in 1991
- GAIL set up north India's only petrochemical at Pata (Uttar Pradesh) in 1999
- Functions under the Ministry of Petroleum and Natural Gas.

Directorate General of Hydrocarbons (DGH)

- Eastablished in 1993, office in New Delhi
- Acts as an advisory and regulatory body for oil and gas exploration and production in India
- Objectives of the DGH include
  - Promote sound management of oil and natural gas resources

- Develop balanced regard for environment, safety, technology and R&D

- The DGH is responsible for implementation of New Exploration Licensing Policy (NELP), production sharing contracts for oil and gas discoveries, and monitoring and review of reservoir performance of producing fields
- Functions under the Ministry of Petroleum and Natural Gas

Petroleum refinement

- There are three public sector enterprises and tro private entrerprises in petroleum refinement: Indian Oil, Bharat Petroleum, Hindustan Petroleum, Reliance Petroleum and Essar Oil
- Indian Oil Corporation Ltd. (IOCL) is the largest in pertroleum refinement and distribution. It accounts for 47% of pertoleum products and 40% of refining capacity
- The IOCL is also the largest commercial enterprise in India

Refinery	State	Operator	Notes
Digboi	Assam	Indian Oil	India's oldest refinery (1901)
Guwahati	Assam	Indian Oil	First public sector refinery
Barauni	Bihar	Indian Oil	
Koyali	Gujarat	Indian Oil	
Haldia	West Bengal	Indian Oil	
Mathura	Uttar Pradesh	Indian Oil	
Panipat	Haryana	Indian Oil	
Jamnagar	Gujarat	Reliance	Largest refining complex in the world
Manali	Tamil Nadu	Indian Oil (Chennai Petroleum Corporation Ltd.	
Bombay High	Maharashtra	Bharat Petroleum	
Kochi	Kerala	Bharat Petroleum	
Vishakapatanam	Andhra Pradesh	Hindustan Petroleum	
Vadinagar	Gujarat	Essar Oil	

MODERN INDIAN HISTORY

INDIAN IN THE EIGHTEENTH CENTURY

The eighteenth century is a historical landmark in the history of the Indian sub-continent. The Mughal Empire which was brought to its pinnacle of glory by the great Mughals saw decline in its fortunes and glory in the eighteenth century during the last years of Aurangzeb's reign who died in February 20, 1707. The succeeding Mughals of the eighteenth century, collectively called the, later Mughals Babadur Shah-I (1707-12); Jahandar Shah (1712-13); Farrukhsiyar (1713-19) Muhammad Shah (1719-38); Ahmad Shah (1748-54); Alamgir II (1754-59); Shah Alam II (1759-1806) were too weak and incompetent to maintain the banner of the Mughal rule and could do little to prevent the rise of the regional powers and Later, the East India Company.

Ques. 1 : Critically explain the reasons for the decline of the Mughal Empire?

Ans. The traditional historiography held the weak successors and incompetent commanders as being responsible for the decline of the Mughal Empire.

Sir J. N. Sarkar understood the revolts by the Marathas, Jats and Sikhs against the background of the religious bigotry of Aurangzeb. However, the reasons are not as simple as the one stated above. While some problems were created under Aurangzeb's rule, some were inbuilt in the Mughal system of administration and only heightened under Aurangzeb who had to face more than enough share of problems.

1. While Aurangzeb expanded the Mughal Empire to its maximum boundaries, the campaigns greatly strained the financial basis of the Mughal Empire.
2. The Mughal system of governance was dependent on the personality of the Emperor. Strong Emperors like Babur, Humayun, Akbar, Jahangir, Shah Jahan and Aurangzeb could exercise a greater degree of check and balance over the vast aristocracy which was of different ethnic background- Turanis, Iranis, Afghans, Sheikhjadas or the Indian Muslims and the Hindus (the Rajputs and the Marathas). Lineage or the ethnic identity was the most important consideration for alliances. It was further expanded by Aurangzeb's conquest of the two Deccani kingdoms of Bijapur in 1685 and Golconda in 1689. Their aristocracy, collectively called the Deccani group, was also absorbed in the Mughal ranks Each faction sought to influence the Emperor in order to gain concessions and more importantly mansabs. The later Mughals could not keep a check on the competition between the divergent groups and matters were made more complicated due to the economic crisis of the eighteenth century related with jagirs and mansabs.
3. Mansabdari and jagirdari crisis? The institution of mansabdari was developed by Akbar and referred to the military organization of the aristocracy Due to its nature each aristocrat/mansabdar was personally loyal to the emperor. Each mansabdar had a dual numerical rank-jat that signified his personal rank and sawar, which decided the number of horsemen he was required to maintain. The mansabdar was paid in cash but mostly by grant of landed estate/jagir and out of its revenue, the mansabdar had to maintain his sawar himself. The jagirs were usually non-transferable (tankha jagir) while other were transferable (vatan jagir). Since the appointments, transference, dismissal or promotion of the jagirs was the sole prerogative of the emperor, there existed a "patron-client relationship" between the emperor and the ruling classes. However, beginning with the last years of Aurangzeb's reign there was a marked shrinkage in the number of jagirs which could not meet the ever

growing ranks of mansabdars. And more than often the jagirs that were allotted were not economically viable, especially those in the Deccan were not fertile and not sufficient enough to meet the needs of the mansabdars. This jagirdari crisis is believed to have intensified the court politics with each faction vying for better jagirs. Under the later Mughals, this crisis kept intensifying and weakened the position of the Emperor. The crisis meant that the emperor was not assured of support and loyalty of the ruling class and this in turn destabilized the military base of the Emperor.

4. Militarily, the Mughal army was weak due to lack of technological innovation and organization. There were contingents of soldiers who owed allegiance to their immediate overlords. It lacked a national character.

5. The Deccan campaign of Aurangzeb proved to be suicidal for the Mughal Empire The war with the Marathas preoccupied Aurangzeb keeping him away from Delhi, the center for power, for most part of the last twenty years of his life. His absence from seat of the Mughal Empire meant that the provisional governors/subedars were beyond his reach and could exercise greater authority in their provinces The Deccan campaign also proved to be a drain on the military strength of the army and the Empires treasury.

6. The continuous campaigns also affected the livelihood of the peasantry. Peasants were allowed to retain the bare minimum of the surplus-produce; the rest was collected as the land revenue out of which the governing class derived its wealth. High land revenue, corruption of the revenue farmers, jagirdars, and petty officials led to over exploitation of the peasants many of whom left agriculture altogether trade was also disturbed especially in the Deccan All of this precipitated the gradual collapse of the Mughal Empire. Even in north India, the heart of Mughal India, many zamindars defied the Mughal authority by often withholding the revenues from it. These zamindars due to their closeness with the peasants who had their own grievance, could mobilize them. The Jat peasants in north India, the Sikhs in the Punjab, the Maratha sadars and the Rajputs of Rajasthan who withdrew their allegiance to the Mughal Emperor all rose up in acts of defiance.

7. Matters were worsened by the series of tribal incursions or raids in India from Central Asia, Eurasia and Afghanistan in the eighteenth century. In 1730s, the Marathas under Shivaji gained access to vast tracts of Central India. In 1738, they even plundered the suburbs of Delhi. Nadir Shah from Persia invaded and sacked Delhi in 1738-39 during the reign of Muhammad Shah. In 1748, the first Afghan invasion was repelled but under the leadership of Ahmad Shah Abdali, Punjab was conquered and he then sacked Delhi in 1756-57. Mughals sought help from the Marathas who were led by Sadasiv Rao Bhao but the latter too were defeated by Abdali at the Battle of Panipat in 1761 (1761 is also the time-frame when the East India Company is gaining strength in Bengal). But soon due to an army revolt Abdali was forced to retreat to Afghanistan. However, the damage to Delhi and the Mughal Empire was done.

8. Due to the weakening of the Mughal Empire many Provincial Governors like those of Bengal, Awadh, Hyderabad and Carnatic established independent kingdoms by 1740s. The period of the later Mughals was marked by the use of the regional powers and gradual decline of the Mughal suzerainty. Thus, by the end of the eighteenth century the Mughal Emperor was confined to a narrow stretch around the city of Delhi.

Ques. 2 : Critically examine in brief the debates on the eighteen century?

Ans. The eighteenth century has been conventionally viewed as a period of decline, anarchy, and economic decay or simply put as the Dark Age. It was held that the decline of the Mughal state corresponded with an overall decline. James Mills like many others, opined that the coming of the British rescued

India from this gloomy existence. However, the recent historiography has refuted this picture of overall gloom and opines that the period was intact marked by the rise of regional powers and reconfiguration of economic and political equations.

The division of 18th century into two periods of transition by Seema Alavi

1. Gradual decline of the Mughal Empire, especially after the death of Aurangzeb in 1707 and the subsequent rise of the regional political order.

2. Consolidation of British colonial power through English East India Company (henceforth EIC)- After Battle of Plassey 1757 and Battle of Buxar 1767- EIC founded in 1600- by a Royal Charter, outsets the Dutch, the French, the Portuguese and other regional powers by the second half of the eighteenth century.

To summarize, the traditional historio-graphy beginning with the decline of the Mughal empire viewed its decline against the light of the religious policies of Aurangzèb leading to 'Hindu reaction' as manifested by the peasant rebellions (Jaudnath Sarkar); Jagirdari and mansabdari crisis (satish chandra), high rate of land revenue demanded by the Mughal state leading to the peasant rebellion, thereby perpetuating the agrarian crisis (IrfanHabib), shortage of Jagirs especially after the conquests of Deccan and the subsequent failure of incorporating the increasing number of nobles in the jagir system (Athar M Ali), cultural decline of India in terms of technology, economic and intellectual spheres and the parallel rise of Europe in these fields. This lent credence to the eighteenth century as the Dark Age. Following this line of argument, the rise of the regional powers- The Sikhs, the Marathas, and the Satnamis, etc was seen in terms of support extended to them by the oppressed peasantry or within the framework of the functioning of Mughal agrarian system.

The earliest economic historians were of the opinion that colonialism led to dislocation of Indian economy.

- They trace the economic decline of India beginning with the decline of the centralized Mughal Empire, which led to dispension of political, economic, cultural vitality from then strong centers of power. This was manifested by the decay of Delhi.
- The Sikh uprisings blocked the trade routes to Lahore thereby affecting trade.
- The Maratha incursions brought much dislocation to Bengal, Bihar and Orissa. They hastened the destruc-tion of the Gujarat silk manufactures.
- Due to the emergence of regional kingdoms, the customs -barriers increased, which led to confining of Bengal's inland trade to Oudh and Assam.
- In the west, the loss of Persian markets due to the invasions, Surat, the leading Mughal port, declined.
- In trading and non-agricultural production sectors the company established its monopoly over salt, opium, and saltpeter. The introduction of agency and contract system in the 1770's and 1780's sidelined the middlemen and brokers from industries such as textiles. The diwani of Bengal granted to the East India Company stopped the inflow of bullion, which created monetary problems: WHY? Before the grant of diwani rights to the EIC, the Company used to bring in bullion from Europe to buy products which meant that India was gaining in foreign exchange. But after the grant of diwani rights, the Company bought Indian products from the revenues thus collected in India, mainly Bengal, and then exported them to Britain This way the balance of trade-was no longer in favour of India Most agree that prior to the Company, Bengal was prosperous .

The recent historiography questions the notion of the overarching centralized Mughal state. They emphasis the necessity of the Mughal state to form and seek support and co-operation of the local magnates and powers for various reasons- collection of revenue, maintenance of law and order, etc, which would ensure relative stability at the supra level. The decline of the Mughal authority at this supra-level did not translate into an overall decline but merely reconfiguration of political, social and economic relations and that there were degrees of continuity. The rise of the regional powers in the eighteenth century is seen in terms of the increasing attempts of the already

existing local/regional powers to assert their independence.

C. A. Bayly opines that the eighteenth century witnessed devolution of not only political but also economic dynamics to the lower levels of sovereignty regional rulers, small potentates and even the little rajas of the villages.

Studies based on regional evidences reveal, three typologies of Mughal successor states and that the economic realignments were responsible for dissociation of the regions from the imperial control.

1. The provincial governors who established autonomous kingdoms by asserting their independence but did not completely severe the connection with the Mughal authority and observed it in symbolic forms, like minting coins in the Emperors' name, mentioning his name in the Friday prayers. Awadh, Bengal Arcot, and Hyderabad are prime examples of this.
2. The warrior states that used non-Mughal symbolism and owed their popularity to their symbolic tradition and military fiscalism - the Marathas, and the Sikhs.
3. The compact local kingdoms that acquired sovereignty in the eighteenth century- Rajput petty states of the north and telegu-speaking clans in the South. Mysore under Tipu Sultan combined the elements of warrior state and compact kingdom and was in some ways more successful in augmenting resources than the Mughal.

The second half of the eighteenth century saw the transition to colonial rule. The debate is between those who believed that the colonial rule changed the society and was a critical break from the Pre-colonial past and economy. On the other hand the recent research has shown that the colonial rule adopted itself to the indigenous situation of the eighteenth century and marked continuity with the economy, society and culture of the pre-colonial days This view is adopted by the revisionist historiography, though not without internal differences amongst themselves, have emphasized the vitality and buoyancy of the regional politics and so forth against the earlier 'dark age' historiography. Tapan Raychaudhuri, Prasannan Parthasarathi, Muzaffar Alam, P.J Marshall, Sanjay Subrabmanyam, Sugata Bose, Ayesha Jalal, C.A. Bayly, and Seema Alavi are the forerunner of the revisionist historiography.

C. A. Bayly identifies three common features amongst all the-regional states that were responsible for regional political crystallization. **First,** the increasing connection of the merchant class with the agrarian sector due to revenue farming led to the emergence of a new class of intermediaries. Thus, a, new class of intermediaries emerged that invested in jagirs and had mercantile interests as well **second**, the process of gentrification because of which the officials benefited by serving the new local powers. And **finally**, the practice of military fiscalism whereby the army was deployed to ensure revenue collection. In short, Bayly emphasizes the rise of the intermediaries, who possessed the trappings of royal -power drew: on Mughal military and fiscal institutions and then emerged as new power centers. Further, he opines that the monetization of agrarian relations and emergence of the market forces weakened the exclusive economic, political and social dominance of caste. The towns and cities had localized manufacturing centers, domestic and export markets were prevalent. The system of 'dadni' or advanced money helped to ensure the control of the merchant.

Bayly opines that political decentralization encouraged the growing economic vitality of small places away from the imperial capitals. The economic decline was, infact, limited in extent and loss of one region was the gain of another. The old trading houses along the coasts suffered due to the emergence of the European trading companies the French, the Portuguese and the English. But it was only in 1850's that Indian merchants truly faced decline. Throughout the eighteenth century the inland and foreign trade by Indians continued.

Seema Alavi argues that the Company was sucked into politics by the internal logic of the indigenous systems. Thus, an element of the continuity is suggested in the trading and the administrative institutes of early colonial India.

Bayly, Winke and Subrahmanyam, proponents of the 'continuity debate' trace the beginnings of nineteenth century agrarian capitalism, in the economies of

the pre-colonial period. They argue that the regional political economy and indigenous capital was involved in internal bulk trade and luxury trade, albeit new routes. The two also played an important role in 'financing of military and revenue machineries'. In short, merchants and financiers were making inroads in the regional politics.

The new regional states made efforts to gain better control over the peasants labour of the artisans and inferior trading groups and were involved in more extensive commercial production. This led to partial dissolution of community-centered production. There was emergence of portfolio capitalists' who straddled the words of commerce and political participation'. Bayly and Subrahmanyam are of the-opinion that the agrarian capitalism of the nineteenth century developed on account of interaction between these evolving indigenous capitalist relations and forces of the colonial capitalism.

There was a degree of dynamism in the sector of foreign trade, the trajectory of which can be traced from pre-colonial period. In the latter half of the seventeenth century the European trading companies linked India with Asian and east African markets and augmented her exports to West Africa, Europe and the New World. One of the major changes in the early eighteenth century was the decline of Surat and the rise of Bengal in commerce.

Prasannan Parthasarthi, however, cautions against over-emphasizing the role of portfolio capitalists, as the increase of the banking interests does not imply a parallel growth of merchant power. Infact, according to him it was their exclusion from the indigenous political order that may have led the merchants to co-operate with the East India Company in the first place.

Tapan Raychaudhuri is of the opinion that the rural sector of the Indian economy remained a source of supply rather than a market for products in the eighteenth century. He traces features of continuity in the organization of manufacturers. The rural consumer was dependent for the bulk of his manufactured goods- on the local populace, which was mostly continued to be distributed through jajmani system, rather than any form of exchange. The tendency towards specialisation of manufacturing was never really absent.

David Washbrook argues that the British grafted itself over the networks of the indigenous economy and infrastructure. Traders, merchants and gentry who were strong intermediary group drifted towards the company as traditional training centers declined. The company started using surplus revenue of Bengal to purchase export goods.

Culturally too lnda did not witness any significant decline in the eighteenth century.

- Even though the Mughal Empire was fading in its glory in the eighteenth century, India retained its cultural vitality. C. A. Bayly opines that "there was a tendency towards greater complexity and richness of religious and cultural tradition rather than toward homogeneity." Devotional cults were patronized by the regional powers both Hindu and Muslim, for example, the Marathas lent support to the shrine of Sufi saint Sheikh Muinuddin Chisti at Ajmer.
- Due to the increased mobility many Southern Brahmins migrated to Benaras and infused a new life to Hindu philosophy of north India.
- In the courts of Carnatic, south Indian classical music developed and flourished.
- Devotional themes were woven in Kangra, Bundi and various Rajasthani forms of painting, which marked a departure from the Mughal miniature painting.

Conclusion

In the eighteenth century one observes several strands of development. While on one hand Mughal rule did wane, on the other hand, the century was marked by rise of regional power. The East India Company signified the next successor political order. The economy too underwent changes. While the traditional centers declined there was a corresponding rise of the regional powers that opened new vistas in economy. The host from the point of modern Indian history, was the growing political influence of the East India Company that gradually became embroiled in the politics of the country, especially Bengal. But even then, the Company rule did not mark a complete break

with the pre-colonial time. The Company could establish it influence only on the basis of collaboration with various indigenous groups, merchants, officials and so on.

RISE OF THE REGIONAL POWERS

Ques. 1 : Briefly discuss the rise of local compact Kingdoms - Rajputs, Mysore, and Travancore?

Ans. Parallel to the weakening Mughal rule was the rise of regional successor states Nature of the regional kingdoms

(a) First were the Provincial Governors who estab1ish independent kingdoms by asserting their independence though they symbolically acknow-ledged the Mughal authority Awadh, Bengal, Arcot and Hyderabad.

(b) Second, the warrior states who used non-Mughal symbolism and owed their popularity to their syncretic tradition military fiscalism - the Marathas, and the Sikhs.

(c) And lastly, the compact local kingdoms that acquired sovereignty in the eighteenth century- Rajput petty states of the north and Telegu-speaking clans in the South. Mysore under Tipu Sultan combined the elements of warrior state and compact kingdom and was in some ways more successful in augmenting resources than the Mughal.

Compact local kingdoms which already enjoyed a degree of autonomy under the Mughal rule but declared their complete sovereignty in the eighteenth century.

1. RAJPUTS

Origins - In the medieval times several wandering warrior groups converged in the north India military labour market which was a recruiting ground for the Mughal army. Rajput was one such group. The specialization of profession offered these group ethnic identities. Social mobility from peasant to Rajput became quite frequent. It was only in the sixteenth-seventeenth centuries that the Rajput organized themselves into about 20 main clans. Their chiefs established centralized control over their territory after getting patronage from the Mughal Emperor whom they paid annual tribute / peshkash as a mark of subordination. The Rajputs enjoyed autonomy in matters concerning the internal administration Many Rajputs were given high military ranks in the Mughal army and the Rajputs were given help by the emperor when consolidating control over their territories. Clan identity decided the matters and relations of power. The Rajputs due to their clan based organization were never free of inter and intra clan rivalries. The weakening of the Mughal control only seed to intensify the clan rivalries due to the absence of check over them by the imperial authority.

2. MYSORE

The emergence of Mysore in South India as an independent under Haider ali and Tipu Sultan was an important development in the politics of the eighteenth century.

Mysore was originally a viceroyalty under the Vijaynagar Empire in the sixteenth century and was transformed into an autonomous principality by the Wodeyar dynasty under Chikkadevaraja Wodeyar (1672-1704). Mysore centralized military power began to increase reaching its height under Haider Ali. But in the period 1731-34, two brothers, Devaraja and Nanaraja usurped power in the Mysore state, reducing the Wodeyar king to the status of a puppet.

Mysore in the eighteenth century was a bone of contention between the Peshwa (Marathas) Nizam, English and the French as they were fighting for supremacy in the Deccan. The Marathas often raided Mysore which left it weak. The Nizam-ul-Mulk Asaf Jah-I of Hyderabad considered Mysore as a part of the Mughal territory. It was during the Second Carnatic War wherein all above powers were involved that Haider Ali, the commander-in-chief of the Mysore army, came to the forefront.

Haider ali- He was born of common parents and began his career as a junior officer in the Mysore army. By 1761 after ousting Nanaraja he took over the political control of Mysore. Haider Ali in the period of 1764-1776 had to sporadically fight the Marathas and placate them by either buying them off or surrendering some territories. But after 1776 he recovered all the surrendered territories and seized all important places in the Krishna-Tungabhadra Doab.

He was a constant thorn for the English. In the first Anglo-Mysore War his alliance with the French and the Nizam dealt the English with a crushing defeat. In the second Anglo-Mysore War (1780-84) in

alliance with the Nizam and the Marathas, Haider Ali defeated the English for the second time in 1782 and captured Arcot. However, during the course of the Battle he died on December 7, 1782 and his legacy was continued- by his son Tipu Sultan.

Tipu Sultan (1782-99):- Tipu Sultan continued with the indecisive second Anglo Mysore War and truce between the two parties was established with the signing of Treaty of Manglore in 1784 on the basis of mutual restitution of conquests. However, the growing power of Tipu alarmed the Marathas and the Nizam who formed an alliance against him but they were too defeated. Their defeat led them to collude with the English and the outbreak of the Third Anglo-Mysore War (1790-92). The third War was concluded with the signing of the Srirangapatnam Treaty in 1792 whereby Tipu had to surrender nearly half of his territories to the victorious allies. The Fourth Anglo Mysore War 1799 was started by the English on the suspicion that Tipu forging alliances with the Nizam; Maratha and had sent embassies to Arabia, the French and to Zaman Shah of Afghanistan. Tipu died fighting in Srirangapatnam in 1799.

Wellesley was the Governor at the time of the fourth Anglo-Mysore War and wanted a complete solution to the Mysore question. The significance of the fall of Tipu was that most of the Mysorean territories were annexed to the East India Company. A subsidiary treaty was signed with a boy successor of the Wodeyar dynasty that made the barely remaining Mysore territory a British dependency. These two steps meant that the English could harness the resources of the Rajah! The few districts of Mysore that the Company gave to the Nizam were taken away in 1800. Now the only groups that were left in the peninsula were the Marathas and The French who were left without a strong prospectively.

The Mysore state under Haider Ali and Tipu Sultan was a force to be reckoned with Haider Ali modernized his army, by having the French training it in infantry and artillery. He further consolidated his power by exerting greater control over the local warrior chiefs or hereditary overlords like the deshmukhs and polygars. While Haider Ali did not assumed the royal title, Tipu assumed the title of Sultan in 1786. Tipu also promoted both internal and foreign trade.

3. Travancore

In south, the southernmost part of the country, the state of Travancore has always maintained its independence from the Mughal reach and reached its independence when in 1729 its king, Martanda Verma, expanded his dominions with his western trained and equipped army. He ousted the Dutch and suppressed the feudal chiefs from Kerala. Even the English were made to accept his terms of trade. In 1766, Tranancore was able to withstand the shock of Mysorean invasions during the time of Rama Varma, Martanda's successor. However, after his death Travancore lost its eminence towards the closing years of the eighteenth century and had to accept a British Resident in 1800.

Martanda by 1740s had laid the foundations of a powerful bureaucratic state and resolved the problems of resources by proclaiming royal monoploy over the pepper trade. The monopoly was later extended on all trade in Malabar.

Rebellions States

The Second category of successor states comprised of those groups which rebelled against the Mughal authority. These successor states were the Maraths, the Sikhs, the Jats and the Afghan kingdoms of Farukhabad and Rohilkhand.

Ques. 2 : Give a brief account of the Anglo-Maratha wars?

Ans. The Maratha was perhaps the only successor state with a potential to establish a pan-Indian Empire and filling the vaccum of the declining Mughal Empire. But the nature of Maratha polity rendered any such project impossible. Shivaji in the seventeenth century formed a small kingdom on the Western Ghats, a region which experienced relatively less interference from the Mughal. But this changed with the advance of Mughal armies in the South, fall of Khandesh, creation of Mughal viceroyalty in Deccan, and the gradual disappearance of Ahmadnagar. After the death of Shivai in 1680 the Marathas were plagued by dynastic factionalism and felt the brunt of the pressure of Mughal policy of Deccan conquest Factionalism led to discord amongst the Marathas with the deshmukhs or revenue officers and zamindars switching allegiance between the Mughals and the Marathas. The nature of Maratha polity changed once again, when from the time of Balaji Vishwanath, the control of the state

passed on to the office of the Pehwas. The Marathas had rivals other than the Mughals, like the Nizam of Hyderabad, Rajputs and the British. The Marathas caused great trouble for these powers as they conducted raids which disrupted other regional states.

The major Maratha sardars were Bhonsle of Nagpur, Gaikwad of Baroda, Holkar of Indore and Sindia of Gwalior.

The First Anglo-Maratha War (1775-82)

Causes

- Struggle for power among the Marathas. The first faction of Sawai Madhav Rao was supported by Nana Phadnis while the second faction of Raghunath Rao had the support of the British.

Course

- The British were defeated by the Marathas at Talegoan in 1776
- March of the British army from Calcutta to Ahmedabad through Central India and winning battles on route under Goddard in 1779-80
- Stalemate and deadlock for two years (1781-82)

Results

- Treaty of Salbai in 1782 whereby the status quo was maintained and it established peace between the Marathas and the British for twenty years.
- The British with the help of the Marathas exerted pressure on Mysore to recover their lost territories from Haider Ali.
- Good move on British behalf because due to terms of the Treaty, Haider Ali was isolated.

The Second Anglo-Maratha War (1803-05)

Causes

- WellesIy's aggressive policy of interference in the internal affairs of the Marathas- his desire to impose subsidiary alliance on them
- By the end of the eighteenth century almost all the experienced Marathas leaders were dead and this provided a window to the British to increase their political control.
- Fratricidal strife amongst the Marathas forced Baji Rao II to flee to Bassein which gave the British an opportunity to force upon Baji Rao II a treaty at Bassein in 1802 that provided for a posting of a subsidiary force permanently in Peshwa's territories. In 1803, Baji Roa II was resorted to the office of Peshwa at Poona under the protection of British troops commanded by General Arthur Wellesley.
- This treaty provided for British arbitration between the Peshwa and the other Indian powers.
- War was declared in 1803. General Arthur Wellesley was the main architect of the war. The aim was to end the influence of French adventurers in Sindhias service, Perron and others, and to establish the control of the British over the Delhi-Agra region and the Emperor. He also wanted to establish a geographical link between the British territories in Bengal and Madras by occupying Bhonsle's territories in Orissa.

Results

- The combined forces of Sindhia and Bhonsle were defeated by the British under Wellesleys command at Assaye and Argaon in 1803 A series of subsidiary treaties were signed with them.
- One of the subsidiary campaigns was that of the British against the Holkar (1804-05) which ended with Holkar by force of circumstances, forced to sign a Treaty of Rajpurghat with Lord Lake. Wellseley had resigned by then.
- The second Anglo-Maratha war led to the establishment of the interests of the British in the Maratha Empire.

¨ The Third Anglo-Maratha War (1817-18)

Causes

- Resentment of the Marathas on account of the loss of their freedom to the British.
- Rigid control exercised by the British

Residents on the Marathas sardars.

Results

- The Peshwa was dethroned, pensioned off and sent to Bithur near Kanpur. All his territories were annexed and formed into the Bombay Presidency.
- In order to placate the Maratha pride a kingdom of Satara was created out of Peshwa's territories.
- Maratha chiefs surrendered large part of their territories to the Company.
- Emergence of British as the paramount power.

Ques. 3 : Briefly describe the rise of sikh power?

Ans. The Sikh Panth of the Punjab was by the eighteenth century almost as old as the Mughal Empire. Guru Nanak was born in 1469 and when he started preaching his message, Babur was founding the Mughal Empire. It was only under Aurangzeb's reign that the two came in conflict in time, the Sikh community grew in size and in its political sphere thereby posing a challenge to the central Mughal authority. Conflict between the two emerged. In 1675, Guru Tegbahadur, the ninth Guru, was executed in Delhi. In 1699, Guru Gobind Singh established the brotherhood of Khalsa, which militarized the Sikh community. There are two possible reasons for this step. According to K Singh it was the increasing conflict with the Mughal that necessitated steps to protect the Panth. McLeod is of the opinion that the transformation was the result of the growing: number of Jat peasantry who already possessed a cultural tradition of carrying, arms and came to dominate the Khalsa at the expense of the older Khatri leadership. By the eighteenth century the identity (though not all Sikhs were a part of the khalsa).

Punjab was strategically important for the Mughals and hence a bone of contention between two powers. Guru Gobind during the times of Aurangzeb and Bahadur Shah I unsuccessfully tried to take over Anandpur and was murdered in a conspiracy on October 7, 1708. The cause of the Guru Gobind was continued by Banda Bahadur whose revolt was suppressed by Farruksiyar (the then Mughal Emperor) in 1715 and Banda Bahadur was executed in March 1716. The series of invasions by Nadir Shah and Abdali worked in the favour of the Sikhs by exposing the weakness of the Mughal authority. The Sikhs amassed huge wealth after the raids and were able to make use of the breakdown of Mughal law and order in the Punjab to establish their own dominance.

This was followed by a period in which the 12 mils or confederacies based on kinship ties held territories as units. It was only under the leadership of Ranjit Singh that Punjab once again rose to eminence in politics,

Ques. 4 : Give a brief account of the establishment of the Jats and Afghan Kingdoms?

Ans. A few smaller states were also established in the eighteenth century after taking advantage of the weakening Mughal control and the Jat kingdom of Bharatpur is an important example of one such state. The Jats were an agriculturalist caste that inhabited the Delhi-Mathura region. Caste affinity with their zamindars enabled the Jats to rise up in revolt against the Mughal authority from the time of Jahangir in 1669. But the Emperor successfully suppressed the revolt. Even though the Jats gradually became politicalised, the Jat state remained feudal with the zamindars holding both administrative and revenue powers Though Churaman and Badan Singh founded the Jat state of Bharatpur, it was Suraj Mal who consolidated Jat power during his rule from 1756-63 The boundaries of the state were expanded to the Ganga on the east, the Chambal in the south, Delhi in the north and Agra in the west. Though Suraj Mal expanded the Jat state and tried to centraize it by diminishing the powers of the zamindars, his death in 1763 also marked the virtual collapse of the Jat state.

Farukhabad and Rohilkhand

A few small Afghan kingdoms were also established in the eighteenth century with the gradual decline of the Mughal Empire. In the fifteenth century Afghans had migrated to India forming a part of the roving bands of warlords and circulated in the north India military labour market. In the eighteenth century due to political and economic disruption in Afghanistan, the migration to India increased. Ali Muhammad Khan taking advantage of the collapse of Mughal authority in North India caused by Nadir Shah's invasion set up a petty kingdom of Rohilkhand in the Hi-

malayan foothills located between Kumaon in the north and the Ganga in the south. However, the Jats, the Awadh rulers, the Marathas and the British gave the Rohilas a lot of trouble as a result of which they could not attain any significant eminence Ahmad Khan Bangash another Afghan established an independent kingdom to the east of Delhi in the area around Farukhabad. Both petty states helped Ahmad Shah Abdali during the Third Battle of Panipat but their influence declined once again when Abdali retired from the Indian stage.

Ques. 5 : Briefly describe the establish-ment of the independent states of Awadh, Hyderabad, Arcot and Bengal?

Ans: Awadh, Bengal, Arcot, and Hyderabad were established by the Mughal provincial governors who did not formally severed their links with the centre yet exercised autonomy in all matters in their regions.

Awadh

Saadat Khan was appointed as the Mughal governor of Awadh in 1722 in order to quell the rebellious local rajahs and chiefs and his success at this prompted the Emperor Muhammad Shah to grant him the title of Burhan-ul-Mulk. However, when Saadat Khan returned the court politics forced him to return to Awadh and build a power base for himself there. Also, he had his own son-in-aw Safdar Jung recognized as his deputy governor by the Emperor. He made the office of diwan virtually independent of the imperial control which meant that the revenues were not reported to the Mughal emperor. His reformed jagirdari system led to the creation of new regional elite of Indian Muslims, Afghans and Hindus, who were his main support base. During the time of Nadir Shah's invasion, Saadat suffered another frustration in his efforts to have greater influence at the imperial court and this failure led him to ally with Nadir Shah. But unfortunately there too Saadat's ambitions went unrealized which led him to commit suicide by poisoning himself. Nonetheless, Saadat developed Awadh as s semi-autonomous regional political state with very little financial obligation to the centre.

Hyderabad

The foundation of the autonomous kingdom of the Hyderabad was laid in 1724 by Chin Qulich Khan who took the title of Nizam-ul-Mulk Asaf Khan. Being a leader of the Turani party of nobles, he-played-an-important role in ousting the Sayyid brothers and restoring the crown to Muhammad Shah. The Sayyid brothers after assassinating the Emperor Farruksiyar had installed Muhammad Shah as a puppet ruler in 1719. Nizam-ul-Mulk was bestowed the title of wazir and acted in such a capacity in the period of 1722-24. But he left the court to establish, an autonomous principality in the Deccan.

In Hyderabad, Mubariz Khan, the Mughal governor acted independently. In 1723, Nizam-ul-Mulk defeated Khan and became the Subahdar of Deccan and consolidated his power around Hyderabad. In 1740, the Nizam finally left Delhi to settle in Hyderabad. By subduing the refractory zamindars and showing tolerance towards the Hindus who possessed economic power, the Nizam developed ruling elite that supported him and by the time of his death in 1748, Hydrabad gained prominence in regional politics. It is important to remember that for practical purposes Mughal suzerainty was acknowledged in symbolic-sense.

Nizam's death not only led to crisis in succession between his son Nasir Jung and grandson Muzaffar Jung but also to depredations by the Marathas. At this juncture the French under Dupleix came to the support of Muzaffar Jung from whom they gained monetary rewards and territorial concessions. But Muzaffar's death in 1748 restarted the old rivalries with the Marathas, Mysore, Carnatic and—the French. Under Nizam All Khan (1762-1 803) after resolving the border issues with the neighbouring powers Hyderabad was given the much neded political stability.

The major events between the Nizam and the British in the eighteenth century were:-

- 1750- The British supported Nasir Jung in a war of succession against Muzaffar Jung but failed.
- 1760- Conclusion of friendly treaty by the British under Colonel Forde with Saadat Jung.
- 1766- Conclusion of an offensive-cum-defensive treaty by which the English gained the Northern Circars from the Nizarn in return for annual tribute.
- 1780-84-Neutrality of the Nizam in the Second Anglo-Mysore War.
- 1790-92 and 1799-the Nizam allied with the English in the Third and Fourth Anglo-Mysore Wars.
- 1798- Conclusion of Subsidiary Alliance

between the Nizarn Ali and Lord Wellesly.

- 1800-The territories that the Nizam gained after the War for helping the British were taken away.
- 1853- Dalhousie coerced the Nizarn to cede Berar in lieu of a subsidiary amount
- Revolt of 1857- Nizam sides with the British.

Arcot

The foundation of the autonomous state of Carnatic with its capital at Arcot was laid in 1720s by Saadutullah Khan (who was its governor and nominally under the control of the Nizam of Hyderabad). Carnatic earlier was one of the provinces of the Mughals in Deccan. He was succeeded by his nephew, Dost Ali who was killed by the Maratha-amy in 1740 and was succeeded by Safdar Ali who in turn was murdered by a relative.

In 1743 the Nizarn of Hyderabad intervened and appointed Anwar-ud-din as the Nawab of Carnatic, who was murdered by Chanda Sahib in 1749 with the help of the French. Carnatic was to play an important role in the Anglo-French rivalry in India. This rivalry was the extension of rivalries arising out the Austrian Succession War between the two in Europe in 1740. By 1745, the war spread to India since the two were also the rival Companies with trading interests in the subcontinent. The following are the important Carnatic Wars.

The First Carnatic War 1745-48)

- The English attacked the .French ships in Pondicherry and the French responded by occupying Madras. The English sought the help- of the Nawab of Carnatic to protect Madras but he was defeated by the French at St Thome.
- End of Austrian War of Succession in Europe but the rivalries in India not yet settled.

The Second Carnatic War (1749-54)

- The French under Dupleix supported succession of Muzaffar Jung in Hyderabad and Chanda Sahib in Carnatic and succeeded while the English supported the rivals- Nasir Jung in Hyderabad and Anwar-ud-din in Carnatic. In exchange, the French gained Northern Cicars, Masulipatnam and some villages around Pondicherry along with posting of a French agent at the court.
- In 1750 the English under Robert Clive defeated the combined forces of the French and the Nawab. Chanda Sahib was killed and the British put Muhammad All on the throne of Carnatic.
- The French did not get support from the French Government as they had already incurred heavy losses in America and India and preferred to sign peace. Dupleix was recalled in 1754.

The Third Carnatic War (1758-63)

- Outbrek of the Seven Years War in Europe in 1756 and the capture of Chandranagore by Clive and Watson in 1757 formed the immediate background for the third war. The French sent Count de Lally in 1758 to reestablish the French in India. Among the series of battles fought between the British and the French and their respective allies, the Battle of Wandiwash in January 1760 was the most decisive battle. It ended the French connection in India: The French Company was reduced to a mere trading company minus any political powers by the Treaty of Paris in 1763.
- With the end of the Third Carnatic War, the British emerged as the biggest political power in India.

Bengal

Bengal was one of the most important successor states which was independent for all practical purposes but owed allegiance to the Emperor in name. Murshid Kuli Khan became the Governor of Bengal in 1717 under the aegis of the Mughal Emperor Farrukshiyar. He came to hold the office of Nizam (governor) and diwan (collector of revenue) which gave him virtually all powers aid helped Murshid Kuli Khan to consolidate his powers in Bengal. Shuja-ud-din became the next Nawab in 1727 and ruled till 1739 when Alivardi Khan assumed control. He made a virtual break with the Mughal Empire. In 1756 Siraj-ud-daula became the Nawab of Bengal after The death of Alivardi Khan.

Murshid Kuli Khan was able to strengthen his position by his successful revenue administration through powerful intermediary zamindars. His measures led to the development of a few powerful zamindars over smaller ones and by 1727, 15 powerful zamindars were responsible for about a half of the revenues. Under him the importance of Bengal as a trading centre gained prominence. The eighteenth century saw the rise of trading and banking families in Bengal, like the Jagat Seths who came to play an important role in the politics of Bengal on account of their financial resources. Jagat Seth had an important role to play in the coup by which Alivardi Khan ousted Shuja-ud-din in 1739-40.

One of the problems .that all the Nawabs faced was the growing independence and impertinence of the English in exercise of their trading privileges. Alivardi Khan's successor was Siraj-ud-daula, whose accession was contested in the court politics, gave the British an opening to increase their influence. The main interest of the English was to prevent succession of an ambitious Nawab who would attempt to tighten the trading privileges enjoyed and exploited by the Company. Siraj-ud-daula was one such Nawab and he was ousted by an alliance between powerful zamindars like the Jagat Seths, Raja Janki Ram, Raja Manik Chand and the East India Company in the famous Battle of Plassey in. 1757.

Ques. 6 : What is the Black hole tragedy of Calcutta?

Ans. Fort William was established to protect British East India Company trade in the city of Calcutta. In 1756, anticipating conflict with French forces, the British began building up the fort's military strength and defences. Fortification was not allowed under the terms by which the English traded. The Nawab of Bengal, Siraj-ud-Daulah, was unhappy with the company's interference in the internal affairs of his region and perceived a threat to its independence. He ordered an immediate stop to the fort's military enhancement but the company paid no heed. As a consequence, Siraj organised his army and laid siege to the fort, whose defenders took many casualties. The garrison's commander organised an escape, and left a token force in the fort under the command of John Zephaniah HoIwell, a one-time military surgeon who was a top East India Company civil servant However a desertion by allied troops, mainly Dutch, made even this temporary defence untenable, and the fort was seized. Indian soldiers took the survivors (who numbered from 64 to .97 together with an unknown number of Anglo-Indian soldiers and the troops, and apparently acting on their own, then packed the prisoners in a guard room measuring 14 by 18 ft (4.3 by 5.5 m) and locked them in overnight. Most of the prisoners died due to heat stroke or suffocation. The corpses were thrown into a ditch. Holwell and three others were sent as prisoners to Murshidabad; the rest of the survivors oh med their liberty after the victory of a relief expedition under Robert Clive.

Ques. 7 : Write short notes on;

(a) Battle of Plassey, 1757

(b) Battle of Buxar and its impact

Ans.

(a) Battle of Plassey, 1757

- In 1717 the Emperor Farrukhsiyar granted the East India Company rights to trade in Bengal without paying the duties in return for an annual payment of. Rs.3,000. It was a privilege that was no even enjoyed by the Indian traders. These duties formed an important source of revenues. However, the problem arose as the servants of the Company started trading privately without paying the duties (the duty-free rights were applicable only for the Company and not private trade). Ambitious rulers like Murshid all Khan and Siraj-ud-daula tried to exercise greater control over the English private trade.
- The English continued fortification of Fort William disregarding the orders of
- the Nawab prohibiting any such measure.
- The Battle of Plassey was fought in 1757 with, the defeat of Siraj by Robert Clive and a new puppet, Nawab Mir Jafar was installed.

Importance- The success of the British established them as the biggest power contender in India and, thereafter the political influence of the British only increased. The English were granted the zamindari of 24 parganas by Mir Jafar in 1757 and in 1760