The three major means of transportation are:
   i. Land transport:
      a. Road transport
      b. Pipeline transport
      c. Railway transport
   ii. Water transport:
      a. Inland waterways
      b. Seaways and Oceanic waterways
   iii. Air transport:
      a. International airways
      b. National airways

Road Transport in India (for 1 mark questions)
   i. About 85 per cent of passenger and 70 per cent of freight traffic are carried by roads every year.
   ii. Road transport is relatively suitable for shorter distance travel.
   iii. The first serious attempt was made in 1943 when ‘Nagpur Plan’ was drawn. This plan could not be implemented due to lack of coordination among the princely states and British India.
   iv. Roads continue to concentrate in and around urban centres. Rural and remote areas had the least connectivity by road.
   v. Sher Shah Suri built the Shahi (Royal) road from the Indus Valley to the Sonar Valley in Bengal. This road was renamed the Grand Trunk (GT). It connected Calcutta and Peshawar. At present, it extends from Amritsar to Kolkata. It is bifurcated into 2 segments: (a) National Highway (NH)-1 from Delhi to Amritsar, and (b) NH-2 from Delhi to Kolkata.

Five classifications of roads in India:
For the purpose of construction and maintenance, roads are classified as
   i. Nation Highways:
      a. These roads are constructed and maintained by the Central Government.
      b. These roads are meant for inter-state transport and movement of defence men and material in strategic areas.
      c. These also connect the state capitals, major cities, important ports, railway junctions, etc.
      d. The National Highways constitute only 2 per cent of the total road length but carry 40 per cent of the road traffic.
      e. The National Highways Authority of India (NHAI) has the responsibility of development, maintenance and operation of National Highways.
   ii. State Highways:
      a. These are constructed and maintained by state governments.
      b. They join the state capitals with district headquarters and other important towns.
      c. These roads are connected to the National Highways.
      d. These constitute 4 per cent of total road length in the country.
   iii. District Roads:
      a. These roads are the connecting link between District Headquarters and the other important nodes in the district.
      b. They account for 14 per cent of the total road length of the country.
   iv. Rural Roads:
      a. These roads provide links in the rural areas.
b. About **80 per cent of the total road length** in India are categorised as rural roads.

c. The rural roads’ density is very low in hilly, plateau and forested areas because these are influenced by the nature of the terrain.

v. **Other Roads:**
   a. **Border Roads:**
      i. These are in the northern and north-eastern boundary of the country.
      ii. The Border Road Organisation (BRO) constructs and maintains these roads.
      iii. These roads are meant for increasing economic development of border areas and for strengthening defence.
      iv. BRO has constructed world highest motorable roads in Leh (Ladakh).
   b. **The international highways:**
      i. These are meant to promote the harmonious relationship with the neighbouring countries by providing effective links with India.

**Important National Highway Projects:**
   i. **Golden Quadrilateral National Highway:**
      a. It will be 5,846 km long with 4/6 lane.
      b. It is a high density traffic corridor and will connect India’s four big metro cities of Delhi-Mumbai-Chennai-Kolkata.
      c. It will reduce the time-distance and cost of movement among the mega cities of India.
   ii. **North-South Corridors:**
      b. It will be 4,076 km long road.
   iii. **East-West Corridor:**
      a. It connects Silchar in Assam with the port town of Porbandar in Gujarat.
      b. It will be 3,640 km long road.

**The uneven distribution of roads in India:**
   i. Density of roads is **lowest in Jammu and Kashmir and highest in Kerala.**
   ii. The density of road is high in most of the northern states and major southern states.
   iii. It is low in the Himalayan region, north-eastern region, Madhya Pradesh and Rajasthan.

**Why does this variation occur?**
   i. **Nature of terrain:** Construction of roads is easy and cheaper in the plain areas while it is difficult and costly in hilly and plateau areas. Therefore, not only the density but also the quality of roads is relatively better in plains as compared to roads in high altitude areas, rainy and forested regions.
   ii. **The level of economic development:** The density and quality of roads is high in urban areas. Therefore all important towns in north India have emerged as important nodes.

**Rail Transport (for 1 mark questions)**
   i. First Railway was introduced in 1853, from Bombay to Thane covering a distance of 34 km.
   ii. Indian Railways is the largest government undertaking in the country.
iii. Broad gauge rail route accounts for 74.14 per cent of the total length of rail routes in the country.

iv. Metre gauge covers 21.02 per cent of the total route length.

v. Narrow gauge is 4.94 per cent of the total length of the Indian Railways. It is generally confined to hilly areas.

Recent Developments and Modernization steps taken in Indian Railways:

i. Extensive programme to convert the metre and narrow gauges to broad gauge.

ii. Steam engines have been replaced by diesel and electric engines which have increased the speed as well as the haulage capacity. It has also improved the environment of the stations.

iii. Introduction of Metro rail in the Kolkata and Delhi has controlled the air pollution in these urban centres.

iv. After the Independence of the country, railway routes have been extended to other areas. Konkan Railway was introduced along the western coast providing a direct link between Mumbai and Mangalore.

v. Konkan Railway constructed in 1998 connects Roha in Maharashtra to Mangalore in Karnataka. It is considered an engineering marvel. It crosses 146 rivers, streams, nearly 2000 bridges and 91 tunnels. Asia’s largest tunnel which is nearly 6.5 km long also lies on this route.

Water Transport: importance

i. It is the cheapest means of transport and is most suitable for carrying heavy and bulky material.

ii. It is a fuel-efficient and eco-friendly mode of transport.

iii. The water transport is of two types— (a) inland waterways, and (b) oceanic waterways.

A. Inland Waterways: in rivers, canals, backwaters, creeks

i. Problems:
   a. It faces tough competition from road and railway transport.
   b. Diversion of river water for irrigation purposes made them non navigable in large parts of their courses.

ii. Inland Waterways Authority looks after the development, maintenance and regulation of national waterways in the country.

Three inland waterways as National Waterways:

iii. **NW 1: From Allahabad to Haldia** (1,620 km) on river Ganga. It is one of the most important waterways in India, which is navigable by mechanical boats up to Patna and by ordinary boats up to Haridwar.

iv. **NW 2: From Sadiya to Dhubri** (891 km) on river Brahmaputra. It is navigable by steamers up to Dibrugarh which is shared by India and Bangladesh.

v. **NW 3: From Kottapuram to Kollam** (205 km) on canal in Kerala. It includes 168 km of West Coast canal, Champakara canal and Udyogmandal canal.

vi. The backwaters (Kadal) of Kerala: Apart from providing cheap means of transport, they are also attracting large number of tourists in Kerala. The famous Nehru Trophy Boat Race (VALLANKALI) is also held in the backwaters.

B. Oceanic Routes (for 1 mark questions):

i. India has a vast coastline of approximate 7,517 km.

ii. 12 major and 185 minor ports provide infrastructural support to these routes.
iii. Approximately **95 per cent of India’s foreign trade by volume and 70 per cent by value** moves through ocean routes.
iv. Apart from international trade, these are also used for the **purpose of transportation between the islands** and the rest of the country.

**Air Transportation (for 1 mark questions):**

i. **First Air transport** in India was in 1911 when airmail operation started over a little distance of 10 km between Allahabad and Naini.

ii. The **Airport Authority of India** is responsible for providing safe, efficient air traffic and aeronautical communication services and manages 126 airports including 11 international, 86 domestic and 29 civil enclaves at defence air fields.

iii. The air transport in India is managed by two corporations, Air India and Indian Airlines.

**Importance of air transport:**

i. Air transport is the fastest means of movement from one place to the other.

ii. It has reduced distances by minimising the travel time.

iii. It is very essential for a vast country like India, where distances are large and the terrain and climatic conditions are diverse.

**Air India:**

a. Air India provides **International Air Services** for both passengers and cargo traffic.

b. It connects all the continents of the world through its services.

c. About **52 per cent of the total air traffic** was handled only at Mumbai and Delhi airports.

**Indian Airlines known as ‘Indian.’:**

a. It is the **country’s largest state-owned domestic carrier.**

b. A new logo which is a partly visible blue wheel and is inspired by the Sun Temple at Konark (Orissa), symbolising timeless motion, convergence and divergence. It also embodies strength as well as trust that has stood the test of time.

**Pawan Hans:**

a. It is the **helicopter service** operating in hilly areas and is widely used by tourists in north-eastern sector.

b. In addition, Pawan Hans Limited mainly provides **helicopter services to petroleum sector and for tourism.**

**Oil and Gas Pipelines**

i. **Oil India Limited (OIL)** is engaged in the transportation of crude oil and natural gas.

ii. **Asia’s first cross country pipeline** covering a distance of 1,157 km was constructed by OIL from Naharkatiya oilfield in Assam to Barauni refinery in Bihar.

iii. Recently, a 1256 km long pipeline connecting Salaya (Gujarat) with Mathura (U.P.) has been constructed. It supplies crude oil from Gujarat to Punjab (Jalandhar) via Mathura.

**Advantages:**

i. Pipelines are the most convenient and efficient mode of transporting liquids and gases over long distances.
ii. Even solids can also be transported by pipelines after converting them into slurry.

Communication Networks

Two categories of the mode of communication:

i. Personal Communication System:
   a. Internet:
      i. Internet is the most effective and advance mode of communication among all the personal communication systems.
      ii. It is widely used in urban areas.
      iii. It enables the user to establish direct contact through e-mail.
      iv. It is increasingly used for e-commerce and carrying out money transactions.
      v. It is provides efficient access to information at a comparatively low cost.

ii. Mass Communication System:
   a. Radio:
      i. Radio broadcasting started in India in 1923 by the Radio Club of Bombay.
      ii. All India Radio broadcasts a variety of programmes related to information, education and entertainment. Special news bulletins are also broadcast at specific occasions like session of parliament and state legislatures.
   b. Television (T.V.):
      i. Television broadcasting has emerged as the most effective audio-visual medium for disseminating information and educating masses.
      ii. First T.V. services were introduced in New Delhi where it began in 1959.
      iii. In 1976, TV was delinked from All India Radio (AIR) and got a separate identity as Doordarshan (DD).
      iv. After INSAT-IA (National Television-DD1) became operational and Common National Programmes were started for the whole country and its services were extended to the backward and remote rural areas.
   c. Satellite Communication:
      i. Satellites are mode of communication in themselves as well as they regulate the use of other means of communication.
      ii. Satellite provides a continuous and larger view of area which has made satellite communication very vital for the country.
      iii. Satellite images can be used for the weather forecast, monitoring of natural calamities, surveillance of border areas, etc.

On the basis of configuration and purposes, satellite system in India can be grouped into two:

a. Indian National Satellite System (INSAT): which was established in 1983, is a multipurpose satellite system for telecommunication, meteorological observation and for various other data and programmes.

b. Indian Remote Sensing Satellite System (IRS) became operational with the launching of IRS-IA in March 1988. These satellites collect data for various uses. These are very useful in the management of natural resources.