

1. Compare the major transportation modes (in detail):

Ans: Major transportation modes are :

- i) Rail Transport
- ii) Road Transport
- iii) Water Transport
- iv) Air Transport
- v) Pipeline -

i) Rail Transport: Railways is one of the most important, commonly used and very cost effective mode of commuting and goods carriage over long as well as short distances.

Advantages:

- a) Faster than road transport.

- b) Suitable for bulky goods.

- c) Economical for large distances.

- d) Least affected by usual turbulences like rain or fog compared to others.

- e) Full protection to goods.

- f) Regularity.

Disadvantages:

- a) Huge investment: This is because the cost of a train is many times higher than that of a road vehicle.

- b) High overhead cost: The railways have to incur high overhead costs because of maintenance of trains and tracks.

ii) Road Transport:

Advantages:

- a) Less capital outlay.

- b) Way to door services.

- c) Less packing cost.

- d) Appropriate for short distance.

- e) Less cost.

- f) Private owned vehicles.

People can stand to have their own particular road transport vehicles and start their own particular transport companies.

- Disadvantages :
- a) Inadmissible for long distance and bulky traffic.
 - b) Irregular Nature.
 - c) Mishaps and breakdowns.
 - d) Moderate speed.

iii) Water Transport: Water transport is the process of transporting a water craft such as barge, ship or sail boat, over a body of water such as sea or ocean.

Primarily used for the carriage of people and non-perishable goods.

- Advantages :
- a) Low cost : Rivers are a natural highway which does not require any cost of construction and maintenance.
 - b) Large capacity : It can carry much large quantities of heavy and bulky goods such as coal and timber.
 - c) Flexible Service

- Disadvantages :
- a) Slow
 - b) Limited area of operation.
 - c) Seasonal character
 - d) Unreliable : Sometimes the river changes its course which causes dislocation in the normal route of trade.
 - e) Unsuitable for small business.

iv) Air Transport : It is the fastest means of transport.

- Advantages :
- a) High Speed
 - b) Minimum cost : No construction of any track, but fares are high comparatively.
 - c) Strategic importance :- Used for internal and external security.
 - d) Free from physical barriers.
 - e) Useful in natural calamities such as flood, earthquake for rescue operations.
 - f) Easy transport of costly and light goods.

- Disadvantages:
- a) more risks - prone to accidents.
 - b) High fares, middle class might not be able to afford air services.
 - c) Huge investments.

✓) Pipelines: Mode of transportation of goods or material through a pipe.

- Advantages:
- a) Ideally suited for transportation of liquid and gases.
 - b) Low energy consumption.
 - c) Needs very little maintenance.
 - d) Safe, accident free and environment friendly.

- Disadvantages:
- a) Not flexible, can be used ^{only} for a few fixed points.
 - b) Capacity cannot be increased once it is laid.
 - c) It is difficult to make security arrangements for pipeline.

2. Discuss the role of Civil Engineering in Railway Engineering.

Ans: In civil engineering, design, construction and operation of all types, of railway systems, which may include main line, metro, light rail or high speed rail are specialised.

Civil Engineering technicians are at the cutting edge of designing, constructing and maintaining infrastructure. In the railway sector, technicians provide technical support to Rail Engineers and many work on-site, undertaking initial survey work, planning and designing maintenance and renewal projects, or supervising time-critical construction work.

As a railway civil engineer, they contribute to transform Britain's rail infrastructure and have the opportunity to visit sites, outline and detailed structural design.

3. Discuss the significance of Varanasi city in context of Indian Railways.

Ans: The Diesel Locomotive Works (DLW) in Varanasi is the production unit of the Indian Railways.

DLW aimed at the achievement of certain enlightened objectives which may be stated as follows:

- ★ To achieve self-sufficiency and modernisation in the national transport system and fulfill the requirements of Indian Railways
- ★ To produce diesel locomotives with as much indigenous components as possible.

Significance of DLW:

- i) A flagship production unit of Indian Railways that offers a complete range of products in its area of operation.
- ii) Employs state-of-the-art design and manufacturing facility for manufacturing around 200 locomotives per annum.
- iii) Provides trail-blazing track record that provides cost-effective eco-friendly and reliable solutions to ever growing transportation needs for over four decades.

Pt. Deen Dayal Upadhyay Station:

Pt. DDU junction is the fourth busiest railway station in India, with about 125 passenger trains passing through it.

It lies in the East Central Railway Zone (ECR). Around 3 lakh passengers per day travel through there.

Manduadih Railway station:

Its also a terminal station of Varanasi. Due to heavy rush at this Junction, the railways developed it as a high-facilitated terminal. The newly transformed station now has a spacious waiting area, circulating rooms etc. The architecture in the station premises reflects Kashi's faith.

4. Mention your hometown and Railway Zone in which it lies and discuss that Zonal statistics and features.

3. Discuss the Indian Rail Network and its future targets.
Discuss the bullet train and its specific features with respect to a civil engineering context.

Ans: * Indian Railways: Indian Railways is a government entity under Ministry of Railways which operates India's national Railway system.

* Its run by government and manages the fourth largest railway network in the world by size and with a route length of 68,185 kilometres as of March 2019.

* Indian Railways is headed by a seven member Railways board whose Chairman reports to the ministry of Railways.

* Zones: Indian Railways divides its operation into zones, which are further sub-divided into divisions, each having a divisional headquarters.

* The Indian Railways is divided into 18 zones and their respective total of 70 divisions.

South Coast Railway Zone is the newest zone in India.

Future Targets

a) Train 18: The trial performance of India's first engineless semi-high speed train - Train 18 has been satisfactory.

Indian Railways is planning to launch Train 18 by the end of 2020. Some of the T-18 features include inter connected fully seated

gangways, automatic doors with retractable footsteps.

b) Library on wheels: The Maharashtra Government started a library in two passenger prestigious trains of the Central Railways.

c) Solar panels to be fitted on the passenger trains: Member rolling stock (MRS) / Railway board has directed IRO AF to fit solar panels on rooftop of four passenger trains which faces the problem of run down of batteries due to slow running of trains.

2) IR introduces e-Drishti:

The Indian Railways unveiled a software that would help Ministry of Railways to keep track of punctuality of trains as well as freight and passenger earnings from anywhere in the country.

Bullet train and its features

The Bullet train is a type of passenger train which operates on a high-speed Railway Network. Capable of reaching a maximum speed of 320 kmph. The bullet train offers riders an exceptionally unique and efficient travel experience.

Features:

- i) Passenger Safety: A special general inspection train will ply on the track once in 10 days, to check the ~~train~~ tracks.
- ii) Around 10 coaches will be business class and the remaining ones will be of standard type.

The business class coach will have leg rests, luggage space and staff rooms including refrigerators, tea and coffee.

7. Discuss the ideal permanent way requirements.

Ans: i) The gauge should be uniform and correct.

ii) Both the rails should be at the same level in a straight track.

iii) On curves, proper super elevation provides to the outer rail.

iv) The track should have enough lateral strength.

v) The radii and super elevation provided on curves should be properly designed.

vi) The track must have a certain amount of plasticity.

vii) All joints, points and crossings should be properly designed.

viii) The drainage system of permanent way should be perfect.

ix) It should have adequate provision for easy renewals and repairs.

x) All the components of permanent way should satisfy the design requirements.

8. What is railway gauge? Discuss the comparative advantages and disadvantages of various types of gauges used in India.

Ans:

9. Discuss the rail types and draw the sections (with scale). Also, compare the various standard rail sections.

Ans: i) Double-headed rails:

These rails indicate the early stage of development. It consists of three parts: i) Upper table ii) web iii) Lower table. Both the upper and lower tables were identical and they were introduced with the hope of doubling the life of rails. When the upper table is worn out then the rails can be placed upside down reversed on the chair and so the lower table can be brought into use.

ii) Bull-headed rails:

It consists of three parts - head, web and foot.

These rails are made of steel. The head is of larger size than foot and the foot is designed only to hold up properly the wooden keys with which the rails are secured.

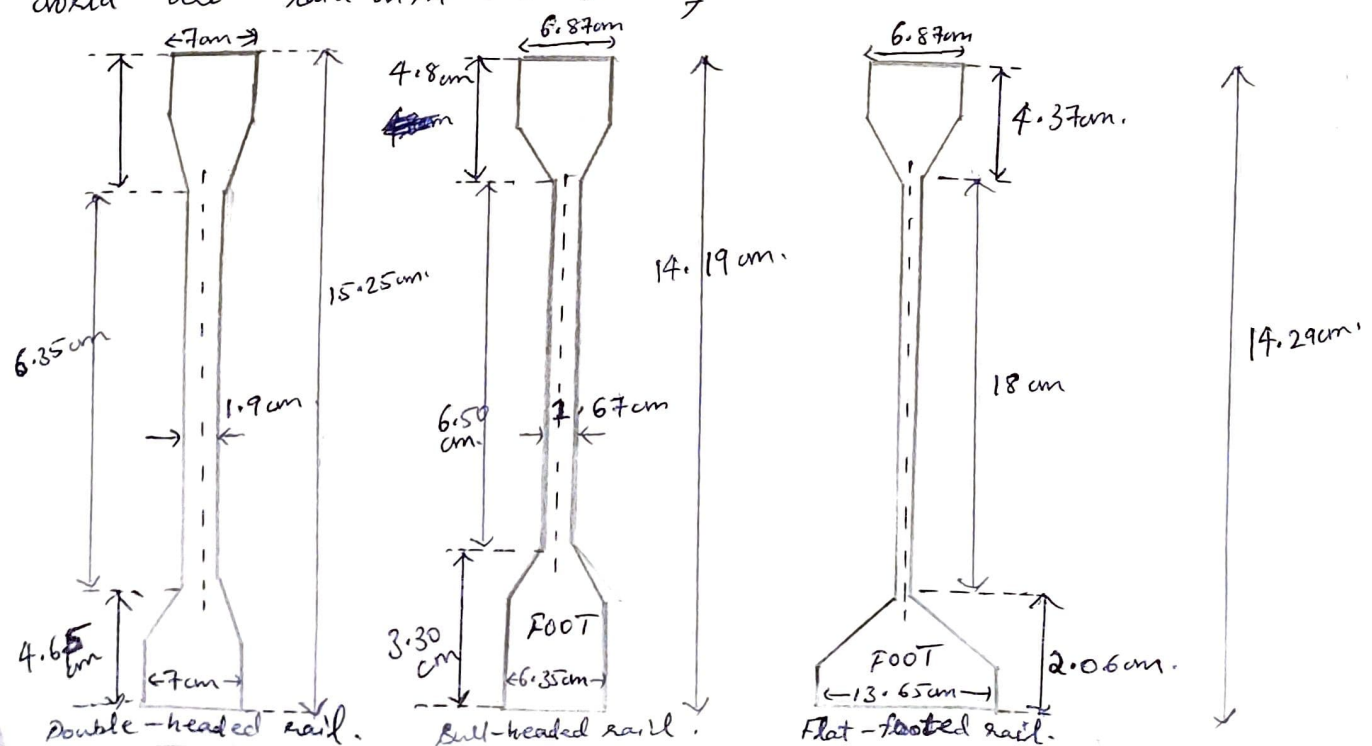
Thus, foot is designed only to furnish necessary strength.

Their weight ranges from 35 lb to 95 lb and length up to 60 ft.

iii) Flat-footed rails:

It consists of 3 parts - The head, web and foot.

The foot is spread out to form the base. This form of rail has become so much popular that about 90% of the railway tracks in the world are laid with this form of rails.



The rail is designed by its weight per unit length. The weight of a rail and its section is decided after considerations such as the following:

- Heaviest Axle Load.
- Maximum permissible speed.
- Depth of ballast cushion.
- Type and spacing of sleepers.

Standard Rail Sections:

| <u>Gauge</u> | <u>Rail Section</u> | <u>Type of Section.</u> | <u>Rail Length.</u> |
|------------------|---------------------|-------------------------|-------------------------------------|
| 1. Broad Gauge | 60 kg/m. | UIC | 13 m (42 ft) as per old standard |
| | 52 kg/m. | IRS | |
| | 90 lb/yd. | RBS | |
| 2. Metric Gauge. | 90 lb/yd. | RBS | 12 m (39 ft) as per old standard |
| | 75 lb/yd. | RBS | |
| | 60 lb/yd. | RBS | |
| 3. Narrow Gauge. | 50 lb/yd. | RBS | 12 m. |

10. From a BG main line curve of 2° , a 4° curve takes off in contrary sense for a branch line. If the speed on branch line is limited to 30 kmph, calculate the cant and maximum permissible speed on the main line.

Ans: