

**Subject: highway and traffic engineering**

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**Ans (1):** so as we know the various modes of transportation consist of rail transport, road transport, water transport, air transport and pipeline

We will compare highway and rail transport

**RAILWAY TRANSPORTATION:**

- In this mode of transport vehicles move on rail tracks
- it is one of the most commonly used mode of transport because it is very effective and is efficient for transporting goods over short and long distances
- the vehicles in this mode are mostly trains which uses locomotive engine which are then powered by electricity, diesel or steam
- its types contain passenger railways, metro underground or overhead and goods transport railways
- this mode has fixed routes and schedules

**HIGHWAY TRANSPORTATION:**

- this means transportation of people or goods and accessories via roads
- the cost of operating and maintaining is less than that of railway
- Its timings and route can be changed according to different conditions hence it has adaptable service
- For short distances it is more economical and faster, and it can transport goods direct to the destination hence it is appropriate for short distances
- In this mode of transport public can have their own private vehicles

**Ans (2)** while conducting a study before s preliminary design of highway we need some specific data and study material which is as follows

- The data about road type such as is it access controlled or not controlled
- What type of area it is, is it urban or rural area?
- What type of terrain it is for example is its plain area or mountainous area or a plateau?
- What will be the traffic density, or the traffic projection means how much vehicles per day for a specific year?
- The study of the branches of highway to each city or town
- The economic study is done i.e. how the highway affect the people on the land of highway or is it an agricultural land and how it be affected after construction

- The financial study i.e. how will it be financed
- The safety measures on the highway according to the vehicle density and the distribution of lanes for the traffic
- Considering the geometric design
- Looking up to the engineering surveys for the highway which include map study, reconnaissance, preliminary surveys and final location
- And studying other things such as road margin, line of sight etc.

**Ans (3):** some of the factors due to which vehicle performance is considered in highway design is as follows

- The road grade can affect the vehicle tires and torque in the vehicles due to which it is considered
- Before designing the highway, the type of vehicles and the loads carried by it is considered
- The flexible pavement and the rigid pavement are considered according to different loads by vehicles which indirectly also affects the vehicles performance
- The radius of the curves on highway affect the vehicles tires and axle which are considered in design
- The highway routes and directions also affect the vehicle fuel economy up to great extent
- The road slopes and curves affect the vehicle operating speed so it shall be considered during design

**Ans (4): DIRECTIONAL DISTRIBUTION IN DESIGN OF HIGHWAYS**

- Defined as percentage of higher volume over total high volume
- This is important in design for directional distribution of traffic
- This factor is used in design in order to convert daily average traffic to peak hour traffic
- All the highways must be designed to control the peak hour traffic in peak direction
- This factor is important in highway design because often there is more traffic in one direction than the other
- **For example, if traffic is split 60/40 and design hourly volume is 420veh/hr. so directional design hourly volume will be  $=0.6 \times 420=252\text{veh/hr.}$**

**Ans (5): BROAD CLASSIFICATION OF SURFACE DISTRESS MODES**

\_\_\_\_\_self-distress modes can be classified into three types

1. **Fracture:** this is caused by excessive loading, thermal changes, fatigue, moisture damage or contraction. And this can be in the form of spalling as well as cracking
2. **Disintegration:** this can occur due to chemical reactivity, aggregate degradation, also loss of bonding and poor consolidation. this is in the form of spalling and stripping

3. **Distortion:** this can occur due to creep, consolidation, frost action, loading or swelling.

**Ans (6): ALLIGATOR CRACKING:**

- This is also called crocodile cracking
- When an asphalt cracks in such a way that the shape looks like the back of crocodile or alligator, that is called alligator cracking
- It is the most serious issue of asphalt cracking because it is very costly to repair
- The main reason of this is water but also excessive loading
- As asphalt is flexible its goes up and down with load so small cracks appear then water seeps in and cracks become bigger causing alligator cracking

**BLOCK CRACKING:**

- A rectangular cracking on the surface of asphalt with a large series is called block cracking.
- It mostly occur in low traffic areas
- As the temperature changes the asphalt shrinks and relaxes with it which causes this type of cracking
- The size of block varies from 1 feet square to 100 feet square
- Can also occur due to large pavement area
- Repair depends on the size of cracking

**LONGITUDINAL CRACKING:**

- These are the cracks that occur parallel to along the road
- Main reasons of this cracking can be poorly constructed joint, fatigue cracking, cracks reflecting up from underlying ground
- Not load related cracks

**TRANSVERSE CRACKING:**

- These cracks appear perpendicular to center line of the asphalt
- Also not load related
- These are usually a type of thermal cracking

**THE END**