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QNo1 ⇒ Keeping in view different modes of Transportation Compare railways with Highways.

Ans ⇒ Transport modes are the means by which passengers and freigh achieve access and mobility between origin and destination. They fall into one of three basic categories depending over what median is used to travel upon.

1) Land (road, rail and pipelines)
2) Water (Shipping)
3) Air (Aircrafts)

⇒ Highways — Car, Bus, Truck, non-motorized etc

⇒ Railways — Passenger and Goods (Freight trains)

⇒ Air ways — Aircraft, Helicopters and Hot-air balloon.

⇒ Waterways — Ships, boats, Submarine, ropeway etc.

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⇒ Continuous flow systems — Pipelines, belts, elevator, ropeway etc.

⇒ Airway

i) Fastest among all other modes.

ii) More comfortable

iii) Time saving

iv) Uneconomical

⇒ Waterways

i) Slowest among all other modes.

ii) It need minimum energy to drag unit load through unit distance.

iii) This can be possible between ports on the sea routes or along the river

iv) Economical.

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Comparizion of Railway and Highways.

⇒ Railways

⇒ The Transportation along the railways track could be advantageous by railways between the station both for the passenger and goods, particully for long distance.

⇒ It depends upon the road transport i.e road could serve as a feeder system

⇒ Energy requiire to drag a unit load through ~~out~~ unit distance by the railway in only 1/4 to 1/5 of that requiired by road.

⇒ Safety (minimum crash rate if handled carefully else sever crash can occur)

Highways => It gives the maximum service to one and all.

4 => It give maximum flexibility for travel with reference to route choice, direction, time and traveling speed.

=> It provide door to door serivce.

=> Other modes are depends on it.

=> It requires small investment for the government

=> Motor vehicle are cheaper than other carries like rail engines

=> It save the time for short distance.

=> High degree of accident due to flexibility of movement.

=> Highway en.

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Q.NO2⇒ You are Transportation engineer. You have been tasked to conduct office study as a preliminary step for design of new Highway. What reference material you will study and what data you will extract

Ans Transportation engineering or transport engineering is the application of technology and scientific principles to the planning functional design, operation and management of facilities for any mode of transporation in order to provide for the safe, efficient, rapid, comfortable, convenient economical and environmentally compatible movement of people and goods.

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Office Study ⇒ The first phase in any highway location study in the examination of all available data of the area in which the road is to be constructed.

⇒ This phase is usually carried out prior to any field or photogrammetric investigation.

⇒ **Data Sources** ⇒ National / Provincial departments - transportation agriculture geology, hydrology and mining.

- ★ Existing engineering reports.
- ★ Maps
- ★ Aerial photographs
- ★ Charts

⇒ The type and amount of data collected and examined depend on the type of highway being considered.

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Area Characteristics covered in data Collection

- Engineering including topography, geology climate and traffic volumes.
- Social and demographic, including land use and zoning patterns
- Enviromental, including types of wildlife, location of recreational, historic and archeological sites and the possible effects of air, noise and water pollution.
- Economic, including unit costs for construction and the trend of agricultural, commercial and Industrial activities.

Preliminary analysis of the data.

- Will indicate whether any of the specific sites should be excluded from further consideration because of one or more of the above Characteristics.

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* For example, If it is found that a site of historic and archeological Importance is located within an area being considered for possible route location, it may be immidiately decided that any route that traverse that site should be excluded from further consideration.

* At the completion of this phase of the study the engineer will be able to select general areas through which the highway can traverse.

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Q.No 3 ⇒ What is Importance of vehicle performance in highway design?

Ans Acceleration and deceleration rates of vehicles are often critical parameters in determining highway design.

⇒ These rates often govern the dimensions of such design features

* Freeway ramps
* Climbing or passing lanes
* Turnout bays for buses.
* Acceleration and deceleration lanes.
* Highway alignment (adequate passing and stopping sight)
* Determine the need for truck climbing lanes.

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Q.No4⇒ Write short note on Directional distribution in design of highways

⇒ **Directional distribution⇒** Consider a rural road with a design volume of 4000 vehicles per hour for both directions of travel combined

⇒ If during the design hour, the directional distribution is equally split or 2000 vph is one direction, two lanes in each direction may be adequate

⇒ If 80 percent of the DHV is in one direction at least three lanes in each direction would be needed for the 3200 vph

⇒ Directional Distribution design hourly volumes DDHV - ADTs are converted to a peak-hour volume in the peak direction of flow.

DDHV = AADT × K (Peak hr) × D (Peak dir - flow)

Example Consider the case of a rural highway that has a 20 year forecast of AADT of 30.000 veh/day for given highway the K factor ranges from 0.15 to 0.25 and the D factor ranges from 0.65 – 0.80

DDHV = ADT × K × D -

DDHV (low) = 30000 × .15 × 0.65 = 2925 veh/h

DDHV (high) = 30000 × 0.25 × 0.80 = 6000 veh/h

QNO5 ⇒ Explain broad Classification of Surface distress modes.

Ans ⇒ Surface distress modes can be broadly classified into the following three groups.

* Fracture ⇒ This could be in the form of cracking or breaking generally due to excessive loading, fatigue, thermal changes.

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* **Distortion** ⇒ This is in the form of deformation, which can result from such things as excessive loading, densification, consolidation or subgrade issues.

Disintegration ⇒ This is in the form of stripping or reveling or removal of paving materials, which can result from such things as loss of bonding, chemical reactivity, traffic abrasion, aggregate degradation or binder aging.

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QNo 6 ⇒ Explain Aligator Cracking, block cracking, Longitudinal Cracking and Transverse Cracking.

Ans **Alligator Cracking** ⇒ Alligator Cracking may be considered a combination of fatigue and block Cracking

⇒ It is a series of interconnected cracks of various stages of development.

⇒ Alligator Cracking develops into a many-sided pattern that resembles chicken wire or alligator skin.

⇒ Occurs in areas subjected to repeated traffic loadings.

Block Cracking ⇒ A pattern of cracks that divides the pavement into approximately rectangular pieces. with sides generally longer than one foot.

⇒ Rectangular blocks range in size from approximately 0.1 m^2 to 10 m^2.

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⇒ Possible cause : Shrinkage of asphalt.

Longitudinal Cracking ⇒

⇒ Crack predominantly parallel to pavement centerline. location within the lane (wheel path versus non-wheel path) is significant.

⇒ Possible Causes: Expansion and contraction of pavement material, roadbed settlement poorly constructed paving joints.

Transverse Cracking ⇒

* Causes:
  - ⇒ Slab longer than required.
  - → Excessive thermal stresses

* Cures
  - ⇒ Crack Sealing
  - ⇒ Full-depth rigid repair
  - ⇒ Dowel bar retrofit.

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