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Question no: 01 Keeping in view different modes of transportation compare railways with highways.

### Railways:

- ① The railway routes are meant only for the movement of trains.
- ② The railway routes require less width of right-of-way.
- ③ The required strength of railway tracks are more.
- ④ Load handling capacity of railways is more and that too at high speeds.
- ⑤ Maintenance cost is more.
- ⑥ Frequency of accidents is less.
- ⑦ Door to door service provision is not available.
- ⑧ Suitable for long distance travelling, and movement of goods.

### Highways:

- ① Highway routes are meant for the movement of busses, trucks, pedestrians etc.
- ② The highway routes require more width of right-of-way.
- ③ The required strength of roadways are less.
- ④ Load handling capacity of road vehicles is less and that too at low speeds.
- ⑤ Maintenance cost is less.
- ⑥ Frequency of accidents is more.
- ⑦ Door to door service provision is available.
- ⑧ Suitable for any distance travelling, mainly short distance.

Question no: 02 You are a transportation engineer. You have been asked to conduct office study as a Preliminary setup/step for design of a new highway. what reference material you will study and what data will you extract.

↳ Office Study:

\* Data Examination: The first phase in any highway location study is 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: Departments of transportation, agriculture, geology, hydrology and mining may be a source of data. The data may be in the form of:

- (i) Engineering reports
- (ii) Maps
- (iii) Aerial Photographs
- (iv) Charts.

Area characteristics covered in data collection:

⇒ Engineering characteristics such as topography, geology, climate, and traffic volumes.

⇒ Social and demographics, including land use and

### Zoning Patterns:

- ⇒ Environmental aspects such as wildlife types, location of recreational centers, historic places and archeological sites and the effect of pollutions.
- ⇒ Economic aspects, including unit cost for construction and the trend of agricultural, commercial and industrial activities.

### Preliminary analysis of Data:

- ⇒ It will indicate specific sites which should be excluded from further considerations because of any of above reason mentioned.
- ⇒ At the completion of this phase study, the engineer will be able to select main general areas through which the highway can be passed.

### Question no: 03 what is the importance of vehicle performance in highway design?

- \* Vehicle performance is important in highway design because no single unit of geometric design/standards can be used for all highways.
- \* Acceleration and deceleration rates of vehicles are often critical parameter in determining highway design.

- \* Vehicle Performance in highway design is important for:
  - ⇒ Adequate passing and stopping distance (sight).
  - ⇒ Highway Turnout bays for buses.
  - ⇒ Setting speed limits.
  - ⇒ Timing of signalized intersection.
  - ⇒ Freeway ramps.
  - ⇒ Climbing or passing lane.
  - ⇒ Acceleration/Deceleration lanes.
  - ⇒ Maximum grades.
  - ⇒ Setting speed limit.

Question no: 04 write a short note Directional distribution in design of highways.

Directional Distribution: Highways must be designed to adequately serve the peak-hr traffic volume in peak direction of flow. Total hourly traffic in both directions is used to design two-lane roads.

- \* In the design of highways with more than two lanes and where additional lanes are expected to be provided later, knowledge of hourly traffic volume for each direction of travel is essential. Typically one direction contributes by 55-70% in total traffic, although occasionally 80% is observed.

For example, a rural road with design volume of 4000 vehicles per hour for both directions of travel. If 80% of DHV is in one direction, at least three lanes in each direction would be needed for the 3200 vph.

Question no: 05 Explain broad classification of surface distress modes.

Surface distress modes can be broadly classified into the following three groups:

- \* Fractures: This could be in the form of cracking or breaking generally due to excessive loading, fatigue, thermal changes.
- \* Distortions: This is in the form of deformation, which can result from such things as excessive loading, densification, consolidation or subgrade issues.
- \* Disintegrations: This is in the form of stripping or removal of paving materials, which can result from such things as loss of bonding, chemical reactivity, traffic abrasion, aggregate degradation or binder aging.

Question no: 06 Explain alligator cracking, block cracking, longitudinal cracking and Transverse cracking?

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  $0.1\text{m}^2$  to  $10\text{m}^2$ .

⇒ **Possible Cause:** shrinkage of asphalt.

\* **Longitudinal Cracking:** These are the cracks which are 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 pavement joints.

\* **Transverse Cracking:** These are an unconnected crack that runs across a road pavement, perpendicular to the direction of the road.

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