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Section :- A

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Qno-1

1 ⇒ Keeping in view different modes of transportation compare railway with Highways.

Ans:- Comparison between Railway & Highway

Railway:-

- ① A railway consists of parallel rails over which a wheeled vehicle may travel. eg train
- ② Railways provide faster service as compared to roadway
- ③ Railway transportation has advantage for moving people and items from one place to another using trains
- ④ It requires a large amount of investment for its construction.

⑤ About $\frac{1}{4}$ to $\frac{1}{5}$ of energy required to drag a unit load through unit distance than roadway.

⑥ It is Safer than roadway.

⇒ Highway:-

- ① A highway is a multi-lane roadway that is especially built for highspeed.
- ② It provides maximum service at all, provide door to door service and
- ③ It does not have a faster service as compared to railways
- ④ It requires small amount of investment for its construction
- ⑤ Engine cost of a motor vehicle is cheaper as compared to railway engine
- ⑥ As it provides maximum flexibility so high degree of accidents occur in it.

Qno 2 :-

2:- You are a Transportation engineer. You have been tasked to conduct office as a preliminary step for design of new highway. What reference material you will study and what data you will extract?

Ans While designing a new highway office study comes first. It is the examination of all available data of the area of proposed highway. By taking help from several sources such as maps, charts, photographs etc, the area is investigated.

=> Preliminary Analysis of Data:-

-> This step is usually done by taking help from several data sources e.g small scale research projects and from other secondary sources.

→ The extracted data help in indicating whether any specific site we should exclude for further consideration or not

In preliminary analysis, following are data with area characteristics are collected.

⇒ Engineering Includes:-

- Geology of the area
- The topography of the area
- Climate and traffic volume of the area.

⇒ Social and Demographic includes :-

- Land use and zoning pattern

⇒ Environmental includes

- Type of wild life exists
- Location of archeological, historic sites
- Possible effects of pollution (air, noise, water)

⇒ Economic Includes:-

- Unit construction cost and trend of agricultural, industrial activities

After the analysis of all the above data, a transportation engineer becomes able to select the general area of proposed area.

After that, Preliminary location survey is conducted in which following Evaluation are done.

1- Economic Evaluation:-

For determining the possible future effects of utilizing the resources during the construction period, this evaluation is conducted for each alternative route.

→ During this evaluation the following factors are considered.

- ⊖ Road user cost
- ⊖ Construction cost
- ⊖ Maintenance cost
- ⊖ Road user benefits and disbenefit

2- Environmental Evaluation :-

For determining the significant effect of construction on surrounding, this evaluation is done.

~ Following are the causes that badly affects the presence of living and non living organisms.

- ~~Plants~~ Plants are badly affected
- Deforestation
- Noise, air & water pollution that causes headaches and problems to the residents living nearby

Qno 3:-

3- What is the importance of Vehicle Performance in Highway design?

Ans Vehicles that travels on a highway always accelerates and decelerates depending upon the traffic volume on that roadway so these two parameter (acceleration and deceleration rate)

are often critical in determining the design of a highway.

For accommodating different type of vehicles (High traffic and low traffic) on a roadway, vehicle performance in highway design is studied.

Other Rates that often govern the dimensions of design factors are:

- Highway Allignment
(Sufficient stopping and passing sight distance)
- Effect of Road grade
(Steep grade ~~low~~ for truck climbing)
- Effect of Horizontal Curvature
- Effect of Pavement
- Turnout bays for busses
- Freeway ramps
- Timing at Signalized Intersections
- Effect of Tractive force level on Energy Dissipation in Tire & Axle
- Acceleration and Deceleration lanes

Qno 4 :-

Write short on directional distribution in design of Highways.

Ans:- It is the predominant one-way traffic volume expressed as a percentage of two-way traffic. It is also known as the D factor and it is an important traffic parameter that is frequently used for design and operational performance analysis of a highway.

→ It accounts for the directional distribution of traffic and also used to convert average daily traffic to directional peak hours factor.

→ In the design process of two or more than two-lane highway where important intersections are observed or where further lanes are to be provided in future, so sufficient knowledge of the hourly traffic volume

in each direction of travel is important
→ Occasionally 80% is observed but typically one direction contributes 55-70% in total traffic.

For Example:-

- Consider a rural road with a design volume of 40,000 vehicles per hour (VPH) for both directions of travel combined.
- If the directional distribution during the design hour easily splits or 20,00 VPH in one direction, two lanes in each direction may be adequate.
- If 80% of the DHV is in one direction, at least three lanes in each direction would be needed for the 3200 vph.

Qno 5:-

5. Explain Broad classification of surface distress modes.

Ans

Surface Distress Modes :-

It is broadly classified into 3 broad groups.

1- Fracture:-

Fracture occurs in the form of cracking and breaking of pavement surface

⇒ Reasons of fracture are:-

1. Excessive Loading
2. Fatigue (Cyclic loading)
3. Thermal expansion and contraction.

2- Distortion:-

It occurs in the form of deformation

The reasons of deformation are :-

- Excessive Loading
- Weakness of base or Sub-grade layers.
- Desiccation

3:- Disintegration:-

The breaking down of pavement into small and tiny pieces is called disintegration. It occurs in the form of stripping or removal of paving material such as aggregate etc.

⇒ The reasons of disintegration are:-

- Loss of Bonding between pavement material
- Abrasion due to traffic
- Aggregate degradation
- Chemical reactivity.

Q no 6:-

6- Explain Alligator Cracking, Block cracking, longitudinal cracking and Transverse cracking

Ans Alligator Cracking :-

It is known as alligator cracks because the cracks are like alligator skin.

- It is considered a combination of fatigue and block cracking.

-> The Reasons of this type of cracking are:-

- ① Load-related deterioration because of weak sub-grade.
- ② Too little pavement thickness.
- ③ Repeated traffic loadings.

⇒ Block cracking :-

It is a series of large rectangular blocks typically (one foot or more) that appears in asphalt pavement.

→ This type of cracking typically occurs where there is no traffic.

→ The reason of block cracking is the shrinkage of asphalt pavement because of the temperature cycles.

⇒ Longitudinal Cracking :-

→ This type of cracking occurs parallel to centerline of asphalt pavement.

→ The reasons of longitudinal cracking are :-

- Poor constructed joints
- Improper paver operation
- Expansion and contraction of pavement material

⇒ Traverse Cracking :-

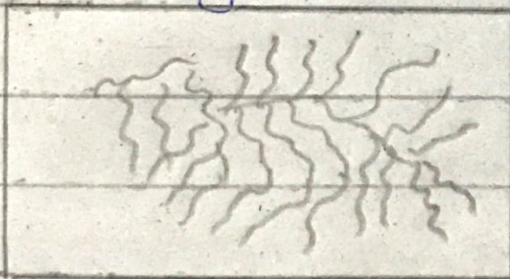
This type of cracking occurs perpendicular to the center-line of asphalt pavement.

→ The reasons of Traverse cracking :-

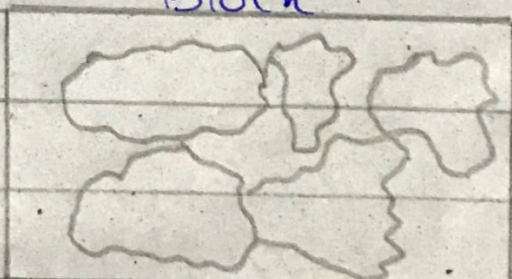
- Shrinkage of Asphalt layer or reflection from an existing crack.
- Poorly constructed joints
- Poorly roadbed settlement

These cracks are not road related.

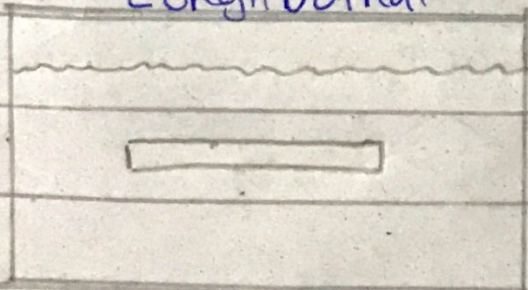
Alligator



Block



Longitudinal



Traverse

