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Section "A"

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Subject Highway and Traffic Engineering

Paper Mid term

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Question #01:

Keeping in view different modes of Transportation, compare railways with Highways.

Answer:

Highways

- ↳ Highways or Roadways are the modes of transportation on land.
- ↳ Highways are the best mode of transportation for shorter distances
- ↳ Highways are having the maximum flexibility for travel with respect to route, direction, time and speed of travel.
- ↳ Highways are the only independent mode of transportation as we don't need any other mode of transportation for access to Highway.

Railways

- ↳ Railways are the steel tracks established on the ground.
- ↳ Railways are best in case of longer distances.
- ↳ Railways are not that much flexible as compare to Highways.
- ↳ Railways are dependent on the Highways as one needs road to go to Railway Station

- ↳ Road System or a Highway Serves as a Feeder System for Railways.
- ↳ Road System can give us door to door Services.
- ↳ Total Cost is less than that of railways.
- ↳ Chances of accident on roads are high.
- ↳ Highways are not good for more loads
- ↳ The resistance produced between the pneumatic wheel and the road is 5 to 6 times higher which means highways are slow mode of transportation as compared to Railways.

- ↳ Railway System could Serves as arteries for transportation by land.
- ↳ Railway system donot have the ability of door to door services
- ↳ Total cost of railways are higher.
- ↳ Railways have less frequency of accident
- ↳ The load capacity of Railway is higher.
- ↳ The resistance produced between the steel track and steel wheel of a rail is about  $\frac{1}{5}$  to  $\frac{1}{6}$  of the highways resistance, it means that Railways are faster than roads System or Highways.

Question No. 1-

You are a transportation engineer and 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?

Answer:

As a transportation engineer, I will study the following materials and will extract important data from them as I have been given a task to conduct office study as a preliminary step for design of new highway.

1) Map Study:

I will first study the map and will suggest alternative possible routes.

↳ I will study the topographic map of the area which will help me to know the natural or artificial things or places coming in that area so that I can avoid route from them.

↳ Map study will also give me a rough guidance of the routes to be further surveyed in the field.

2) Study of pre existing information:

I will study the information which is already collected about the people, places of the area where the highway is to be constructed.

↳ I will study the traffic volume or frequency of the area which can help me to decide the width of the road and the numbers of lanes.

↳ I will also study about the type of soil of the area.

Data to be collected by studies:

I will study different materials and will try to extract the following data from my study.

- 1) Religious places or any other permanent structures of the area.
- 2) Valleys, ponds, lakes, hills etc
- 3) High Flood level of the area
- 4) Soil characteristics.
- 5) Geological features  
etc

Question#03:

What is importance of vehicle performance in highway design?

Answer:

Vehicle Performance:

Vehicle performance is the study of the motion of a vehicle which depends upon all the forces and moments that act upon it.

Importance of vehicle performance in Highway design:-

While designing a Highway, the important parameters to be considered are Acceleration and deceleration rates of vehicles.

↳ These parameters can help us to decide or choose the dimensions of the following Highway design features.

- a) Acceleration or deceleration lanes which is related to the speed of the vehicles.
- b) It can help us to decide where should we design a freeway ramp, where vehicles comes in and out of the highway.

- c) Vehicle performances are also important to decide the lanes for slower vehicles (Trucks etc) and also lanes for Speedy vehicles.
- d) It also helps us to decide the dimensions and position (location) for bus bay or bus turnout.
- e) Having an idea about the vehicle performance can help us in highway alignment so that to have enough passing and stopping sight distance.
- f) Vehicle performance is very important in highway design because it helps us while designing different design features of Highway.

Question#0<sup>4</sup>1-

Write Short note on Directional distribution in design of highways.

Answer:

## Directional distributions:

Directional distribution is the factor reflecting the proportion of peak-hour ~~factor~~ traffic traveling in the peak direction

## Directional distribution in design of Highway

Consideration of directional distribution in the design of highway is very much important as we see most of the time there is much more traffic in direction than the other.

- ↳ It can help us in choosing the numbers of lanes in the highway
- ↳ Highways should be designed to adequately serve the peak hour traffic volume in the peak direction of flow.
- ↳ For Rural and Suburban areas roads, the directional distribution factor should ranges from 55 to 80 percent
- ↳ A factor of almost 50% is almost used for urban highways



Explain broad classification of Surface distress modes.

Answer:

Surface distress :-

Surface distress is actually the indications or sign of poor performance of pavement and the indication of failure of pavement.

Classification of Surface distress mode :

Surface distress mode can be classified into the following three categories.

- 1) Fracture
- 2) Distortion
- 3) Disintegration

1) Fracture :-

This type of Surface distress could be possible in the form of Cracking.  
↳ It can occur both in flexible and rigid pavements.

↳ This can occur due to excess of loading, fatigue, slippage or contraction etc

## 2) Distortions

Another type of surface distress is distortion which occurs in the form of deformation

↳ This distortion can occur due to excessive loading, creep, consolidation, swell or frost action.

## 3) Disintegration

As clear from its name this type of surface distressing is in the form of stripping, raveling or spalling.

↳ This type of surface disintegration occurs due to weakness in bonding, chemical reactivity, traffic abrasion, degradation of aggregate, poor or weak compaction etc.

Question # 06

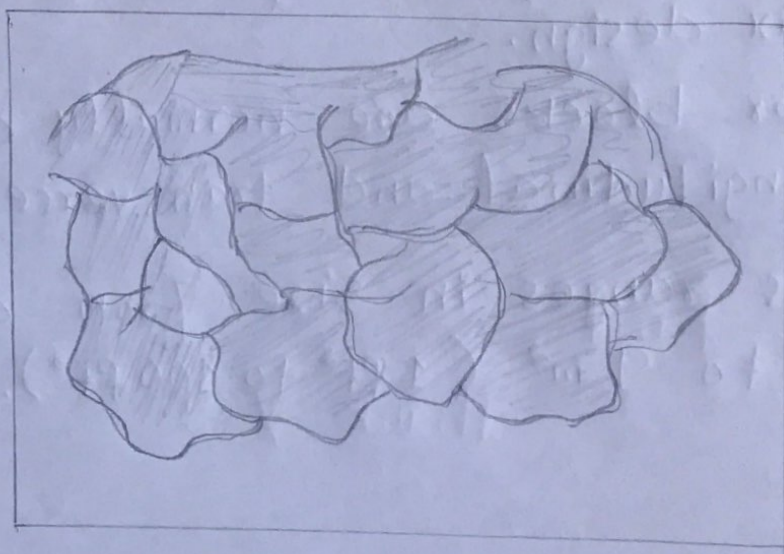
Explain Alligator cracking, block cracking, Longitudinal Cracking and Transverse Cracking.

Answer:-

Alligator Cracking:-

Alligator cracking is also called Corcodile cracking as the pattern form by this type of cracking is like a corcodile skin.

- ↳ This is one of the most common way that asphalt pavement can decline over time.
- ↳ This is one of the serious problem that an asphalt surface can produce.
- ↳ This type of cracking occurs due to over loading



## Block Cracking :-

This type of Cracking in the pavement is found more commonly in low volume road pavement, residential driveways and parking spaces etc.

- ↳ Block cracking is extremely rough and as it worsens, it leave that area unfit for transportation use.
- ↳ This type of cracking does not occur due to excess of load but due to the asphalt binding agent.
- ↳ when the binder become older, it become hard and the pavement starts contracting slightly and the pavement is not able to flex like it was before.
- ↳ This type of Cracking can also occur due to the poor asphalt binder in the mix design.
- ↳ Larger blocks are normally classified as longitudinal and transverse cracking.
- ↳ Blocks ranges in size from almost  $0.1 \text{ m}^2$  to  $9 \text{ m}^2$  ( $1 \text{ ft}^2$  to  $100 \text{ ft}^2$ ).

## Longitudinal Cracking :-

This type of cracking occurs parallel to the centerline of the pavement road.

↳ These can be mostly caused by a poorly constructed joint or shrinkage of the asphalt layer

↳ These cracks are also not due to over loadings.

## Transverse Cracking

unlike of the longitudinal cracking, this type of cracking occurs almost perpendicular to the centerline of the pavement.

↳ These types of cracks cannot be produced due to over loading.

↳ Transverse cracking may produce due to the shrinkage of the asphalt layer.

↳ These cracks ~~are~~ can also occur from the reflection of an existing crack.

Longitudinal Cracking

This type of cracking occurs parallel to the centerline of the pavement slab.

↳ These cracks are mostly caused by a

poorly constructed joint or shrinkage of the asphalt layer.

↳ These cracks are also not due to over loading.

Longitudinal Cracking

Transverse Cracking

Unlike of the longitudinal cracking,

this type of cracking occurs almost

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pavement.

↳ These types of cracks cannot be produced due to over loading.

Transverse Cracking

to the shrinkage of the asphalt layer.

The End

Thank you.