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Section A

Program BE (civil)

Subject Highway & Traffic Engineering

Module 6th Semester

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Q.No 1:-

=> Different modes of Transportation:-

↳ Transport modes are the means by which passengers and freight achieve access and mobility between origion and destination. They fall into one of three basic catogories depending over what median is used to travel upon.

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

i→ Highways :-

→ Highways are one term of land modes of Transportation which gives maximum Service to one and all.
→ It also gives max flexibility for Travel with reference to route choice, direction, time and Traveling Speed.
→ Also provide door to door Service.
→ Other modes depends on it
→ Saves time for short distance.
→ accident Chances are high due to flexibility of movement.

ii → Railways :-

→ Railways are also includes in Land mode of Transportation this depend upon the road Transport i.e Road could Serve as a feeder System

→ The Transportation along the railway Track could be advantagious by railways between the Stations both for the passenger and goods, particularly for long distance.

→ this System is more safe for Transport as compare to other mode minimum crash occure if handled carefully.

iii → Waterways :-

→ this mode of Transportation is Slowest among all other modes.

→ Needs minimum energy to drage unit load through unit distance

→ This can be possible b/w ports on the Sea routes or alon the River.

→ Also Economical and Consume less amount of Resources.

iv → Airways :-

→ This mode is fastest among all other type of Transportation modes.

→ More Comfortable then the rest

→ It saves time.

→ But Airways mode is less Economical.

Comparing railways & Highways.

Railways	Highways.
1 → Railways are particular advantegeous for long distance b/w Station	1 → It saves time for short distance
2 → It depends upon the Road Transport or Highways.	2 → It doest depends upon the Railways all the time.
3 → provide Station to Station Service only.	3 → Provide door to door Service
4 → vehicles are uneconomical as Compare to Road vehicles	4 → Motor vehicles are cheeper as Compared to rail Engins.
5 → High Safety less accident.	5 → High degree of accident occurs.

Q No 2

Ans :-

Office Study :- Office Study is 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. So after this phase which is usually carried out prior to any field we will be investigate the following data material which is given below.

→ Data Extracted :-

→ Existing engineering report

→ Maps

→ Aerial photographs

→ Charts.

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

→ Area characteristics covered in data collection :-

→ Engineering, including topography, geology, climate and traffic volumes.

→ Social and demographic, including land use and zoning patterns.

→ Environmental, including type of wildlife, location of recreation, historic, and archeological sites; and the possible effects of air, noise, and water pollution.

→ Economical, including unit costs for construction and the trend of agricultural, commercial, and industrial activities.

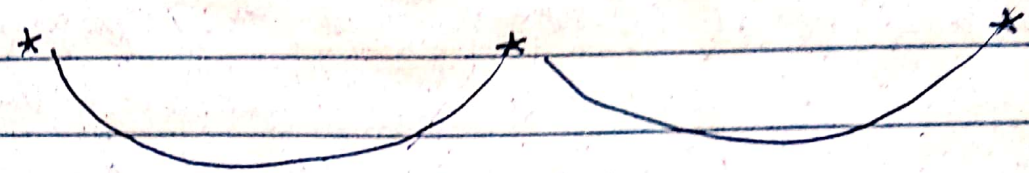
→ Preliminary analysis of data:-

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

→ For example, if it is found that a site of historic and archeological importance is located within an area being considered for possible rout location, it may be immediatly decided that any route that can traverse that site should be excluded from further consideration.

→ At the completion of this phase of the study the Engineer will be able to selecte general

area through which the highway can Traverse.



Q No 3:-

Importance of vehicle performance in highway design:-

→ In real world collision with Traffic rails and other roadside safety structure, a successful outcomes is dependent on the structure and geometric properties of both the impacting vehicles and the roadside structure. In the many year full-scale of highway crash testing safety. a number of drametic test failure have been obsenved which illustrate the importance of vehicle/traffic - barrior interaction. There is a need for barrior designer and vehicles designers to better understand each other's methodologies such that protection of the motoring public is mixmized.

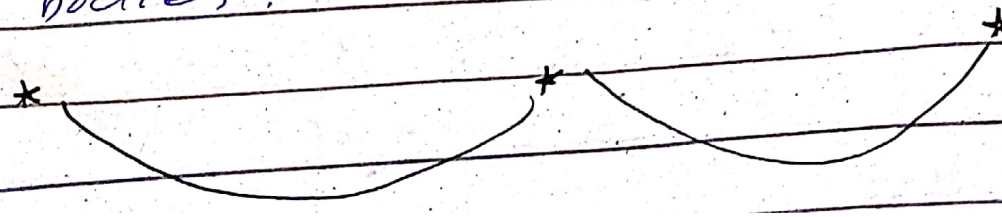
→ Acceleration and decleration rates

of vehicles are often critical parameter in determing highway design.

=> These rates often govern the dimensions of such design features which is given below:

→ Freeway ramps
→ Climbing or passing lanes
→ Turnout bays for buses
→ Acceleration and deceleration lanes
→ Highway alignment (adequat passing and stopping sight distance)
→ Determing the need for Truck climbing lanes (steep grade)

- So as the performance depends upon all the forces and moments that act upon it also it relates with vehical moment which directly affect on the performance. for good perform of vehical, vehicles always assumed as a rigid bodies:



Q No 4:-

Ans:→ Direction Distribution in Design of Higway:-

→ Highway must be designed to adequately serve the peak-hour Traffic volume in the 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 on two-lane roads where important intersection are encounted or where additional lanes are to be provided later, Knowledge of the hourly Traffic volume for each direction of travel is essential - Direction Traffic is used for multilane roads and Streets.

→ Typically, one direction contribute by 55-70% in total Traffic, although occasionally 80% is observed.

Example:-

→ Considering a rural road with a design volum of 4,000 vehicles per hour (vph) for both direction of Travel combined.

→ If During the design hour, the

Directional distribution is equally split or 2,000 (vph) is one direction, two lanes in each direction may be adequate.

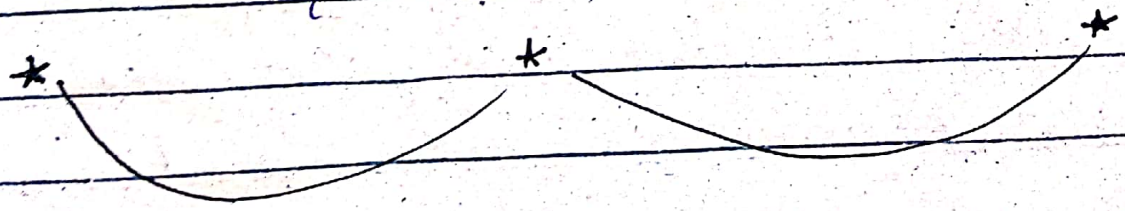
→ If 80% of the DHV is in one direction, at least lanes in each direction would be needed for the 3,200 vph.

→ Directional Design Hourly volume
DDHV - ADTs are converted to a peak-hour volume in the peak direction of flow.

$$DDHV = AADT \times K(\text{Peak hr}) \times D(\text{Peak hr - flow})$$

where
K = Proportion of DT occuring during PH
D = " of Peak hr Traffic Travelling in peak direction of flow.

↳ for design, the K factor often represents the proportion of ADT occuring during the 30th peak hr of the year.



Q.No 5

Ans :- Classification of Surface Distress modes :—

=> Surface distress is "Any indication of poor or unfavourable pavement performance or sign of impending failure; any unsatisfactory performance of a pavement short of failure"

=> Surface Distress modes, can be broadly classified into the following three groups.

1 → Fracture :-

→ This could be inth form of cracking (in flexibile and rigid pavement) or Spalling resulting from such things as excessive loading, fatigue, thermal changes, moisture damage, Slippage or Contraction.

2 → Distortion :-

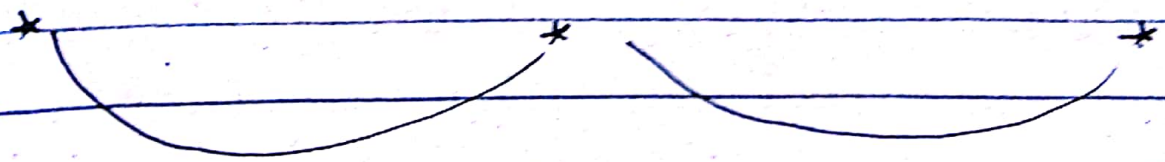
→ This is in the form of deformation (e.g. rutting, Corrugation : and Shoving) which can result from such things as excessive

loading, creep, densification, consolidation, swelling, or frost action.

3 → Disintegration:-

→ This is in the form of stripping, ravelling or spalling, which can result from such things as loss of bonding, chemical reactivity, traffic abration, aggregate degredation, poor consolidation/compaction or binding aging.

↳ Thus surface distress will be somewhat related to roughness (the more cracks, distortion and disintegration - the rougher the pavement will be) as well as structural integrety (surface distress can be a sign of impending or current structural problems)



Q.No 6

Ans:→ Explanation of the following term

i→ Alligator cracking ii→ Block cracking

iii→ Longitudnal cracking iv→ Transverse Cracking

i→ Alligator Cracking:-

→ In the asphalt industry, alligator cracking refers to a surface damaged in such a way that the cracks form a pattern that looks like reptile scales, most notably those on an alligator or crocodile's back. The pattern usually begins with longitudinal cracks. which are then connected by Transverse cracks. These creates geometric shape that are normally interconnected and which can spread over a wide area in a relative brief period.

→ This type of cracking is one of the most serious issues that can effect as asfalt surface in Austin.

ii → Block Cracking :-

→ Interconnected cracks that deviide the pavement up into rectangular pieces. Block range in size from approximetly $0.1 m^2$ to $9 m^2$.

→ Block cracks generally occur at parking places and other places where the traffic load is not that high.

⇒ Reasons of occurence :-

→ The main reason is oxidative hardening of binder/asphalt of the asphalt mix used in those pavements. Due to which the tensile Strength of the binder reduces So when the tensile Sterength induced by the traffic exceeds the block cracking occurs.

Now lets discuss the prevention

⇒ Prevention :-

1 → Primery compaction Should be high

2 → Maintaining Controlled mixing temprature.

3 → Design and evaluate the asphalt mixes for parking lots separetly for higher air void content.

iii → Longitudinal Cracking :-

→ Cracks parallal to the pavements centerline or laydown direction termed longitudinal crack
→ Also can be a type of fatigue cracking or top-down cracking.
→ The main problem from this type of cracking is allowing moistur infiltration, roughness and it may indicates the possible onset of alligator cracking and structural failure.

⇒ Causes :-

→ poor joint construction or location, can cause this type of cracking.
→ A reflective crack from an underlying layer.
→ HMA fatigue
→ Top down cracking.

⇒ Repair of longitudinal Cracks:-

→ Strategies depends upon the Severity and extent of the cracking:

1 → Low Severity Cracks
less then ½ inch wide and infrequent Cracks.

2 → High Severity Cracks.
greater the ½ inch wide. and numerous Cracks. which helps to remove and replace the Cracked pavement.

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iv → Transverse Cracking:-
Cracks which are perpendicular to the pavement's centerline or laydown direction.

→ Usually a type of thermal cracking.

→ This type of Cracks caused a problem of allowing moisture infiltration, roughness also.

⇒ Causes:-
Causes included

1 → Shrinkag of HMA Surface due to low temprature or

2 →

asphalt binder hardening.

2→ Reflective crack caused by cracks beneath the Surface HMA layer

3→ Top down cracking.

⇒ Repair of Transverse Cracking:-
Strategies for Transverse cracking is also the same for longitudinal cracking.

→ low Severity cracks:-
Which is < ½ inch wide and infrequent cracks. which helps to Seal to prevent entry of moisture into the Subgrade through the cracks.

→ High Severity Crack:-
(> ½ inch wide and numerous Crack) which helps to remove and replace the cracked Pavement layer with an overlay.