

# MID TERM PAPER

Online

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Section "A"

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Subject Highway and Traffic Engineering.

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Section A

Q1

Keeping in view different modes of transportation compare railways with Railway Highways.

Ans

The Railway consist of parallel rails which vehicle may be travel (train)

- L> The transportation along the railway track could be advantage by the Station
- L> about  $\frac{1}{4}$  to  $\frac{1}{5}$  of energy required to drag a unit load through unit through distance than roadway.
- L> it depend upon the road transport
- L> Railway transportation is advantage for moving people and good from one place to another using trains.
- L> it require large investment for the government
- L> It is safer than roadway Highway. minimum crash rate if handled carefully
- L> Save time for long distance
- L> it depend upon the road transport
- L> minimum crash rate ~~to~~ occurred of handled carefully.

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### Highway:-

- L> The maximum flexibility for travel with the reference to the route of choice in direction time and traveling speed.
- L> The Highway is a multi-lane roadway that is especially built and high speeds there for connect major and population centers.
- L> Save the time for short distance.
- L> The roadway High degree of accident due to the flexibility of movement
- L> it do not provide which faster service as compared to railways.
- L> it required small investment for the government.
- L> Engine cost of a motor vehicle is cheap cheaper than a railway engine
- L> it provide door to door service
- L> As it provides maximum flexibility so high degree of accidents occur in it.
- L> other modes are depend on it.

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Q2

You are a 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

The transportation engineer I have 'new design highway and following material The study of material and the study data I will extract in a preliminary step in the office study.

- L> The highway location study is examination of all available data of the area in which the road is to be constructed.
- L> it is the position of feasible routes are set as closely as possible by the establishing all the control point. Determine preliminary vertical and horizontal for each other.
- L> The feasible routes identified are plotted on photographic base maps.
- L> preliminary alignment are used to evaluate the economic and environmental feasibility of the alternative routes.
- L> Feasible routes as identified by a stereoscopic examination of the aerial photographs taking in consideration factors such as.

### Economic evaluation:-

The economic evaluation of every alternative route is to be carried out to determine the future effect of investing of resources to construct the highway.

- L> Factors considered in economic evaluation
  - L> Road user costs
  - L> construction costs
  - L> maintenance costs
  - L> Road user benefits
  - L> Road user dis benefit as adverse impacts due to dislocation of families businesses and so forth

### Environmental evaluation:-

- L> Highway construction at any location significant on surrounding.
- L> Essential to evaluate environmental of alignment selected.
- L> A highway - an integral part of the local environment.
- L> In cases environmental impact study (EIS) is required it is conducted at this stage to determine the environmental impact of each alternative route.
- L> EIS will determine the negative and/or positive effects the highway facility will have on the environment.
- L> The variables are interrelated in manner that maintains equilibrium and sustains diff communities.

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Q3 What is importance of vehicle performance in highway design.

Ans Accomodating different type of vehicles (High traffic and Low traffic) roadway vehicle performance in highway design is studied other rate that often govern the dimensions of design factors.

- > The weight and size of vehicle is important in determine the physical component of highway
  - Lane with width Such.
  - Shoulder with ~~width~~ width.
  - Length of vertical curve
  - pavement depth.
- > The vehicle at on a highway always accelerate and decelerate depending upon the traffic volume on that roading So these two parameter & are often critical in determining the design of a highway.
- > Force that act on a vehicle while it is in motion are.
  - > Air resistance - resistance of air in front of vehicles.
  - > Rolling Resistance - frictional slip between pavement surface and tires.
- > Highway Alignment
  - > Freeway ramp.
  - > Acceleration and Deceleration lanes.
  - > Turnout bay for Buses.
  - > Effect of Horizontal curvature
  - > Effect of Road Grade.

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Q4

Write short note on Directional distribution in design of highways.

Ans.

Directional Distribution:-

The distribution is

Simply and Split of the total traffic volume in two opposite direction of traffic flow

↳ The two way traffic volume that is determined by multiplying the (ADT) by a percentage. The  $K$  factor value of  $K$  typically range from 8 to 12 for urban facilities

↳ The highway design to adequate serve the peak hour traffic volume in peak directional of the flow.

↳ The design of highways that will be accommodate all class of vehicles width and height overhangs and minimum turning. paths at intersections are important parameter to have at hand during the design process.

↳ The highway Two line design road for total hourly traffic in both directional.

↳ Design Speed is the maximum safe speed that can be maintained over a specified section of a highway when condition are so favorable that design features of the highway govern.

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- L> That the design of highway with the more and two line when importance intersection are encountered or where additional lines are to be provided better.
- L> major element of the highway design include stopping sight distance passing sight distance and horizontal and vertical alignment
- L> The one direction contributes by 55-70% in total traffic although occasionally 80% observed.
- L> The Directional traffic is used for multi lane roads.



Q.5.

Explain broad classification of surface distress modes.

Distress:-

The condition of a pavement structure and reduce serviceability or lead to reduction service life Distress in every indication of poor or unfavorable pavement

↳ The designed properly and maintained HMA pavement can provide many years of satisfactory service. However like pavement HMA pavement can be damaged by certain conditions.

Classification of Surface Distress

mode:-

Surface Distress mode can be broadly classified there are three group.

Fracture:-

The Fracture can be occur into the form of cracking and breaking generally to high loading fatigue thermal changes.

Thermal cracking in asphalt pavement continues to a significant pavement distress mechanism in cold climate regions the formation of discontinuities due to thermal cracking cause extensive damage to the integrity of the pavement and form pathways for intrusion of water into the base and subgrade layers current use of performance based binder specification has not been shown to effectively lower the propensity for this distress.

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## Distortion

The form of deformation which in reason due to the high loading densification consolidation or subgrade issue.

There are the different forms of distortions in an asphalt pavement are caused by instability by an asphalt mix or weakness of the base or subgrade layers.

**Rutting:-** Rutting is a linear surface depression in the wheelpath. Rutting is caused by deformation or consolidation of any of the pavement layer or subgrade.

**Shoving:-** Shoving is the formation of ripples across a pavement. The characteristic shape is why this distress is sometimes called wash boarding. Shoving location having severe horizontal stress.

**Patch failures:-** When pavement are patched some distress may be begin to occur. The rate at which a patch deteriorates is influenced by compaction material selection.

**Disintegration:-**

The form of stripping in raveling or removal of paving material with the result from such thing the loss of bonding chemical reactivity.

Disintegration is the breaking up of a pavement into small loose pieces including the dislodging of aggregate particles improper curing and finishing of the concrete suitable aggregates and improper mixing of the concrete can cause the distress Disintegration typically falls into the following categories.

Disintegration in a flexible pavement is typically caused by climate insufficient asphalt binder in the mix loss of adhesion between the asphalt coating and aggregate particles or severe overheating of the mix the following types of disintegration commonly occur

Q No. 6) Explain Alligator cracking block cracking longitudinal cracking and transverse cracking.

Ans Alligator cracking:- Alligator cracking develops into a many-sided pattern that resembles chicken wire or alligator skin.

- ↳ Chicken-wire cracking Spider web cracking map cracking.
- ↳ Alligator cracking may be considered a combination of fatigue and block cracking.
- ↳ indicative of fatigue failure of pavement due to repeated traffic loads.
- ↳ it is a series of interconnected cracks of various stages of development.
- ↳ Alligator crack is one of the most serious issues that can affect an asphalt surface in Austin.
- ↳ The Alligator cracking unlike surface level asphalt damage fatigue cracking is almost always caused by problems beneath the asphalt in the underlying layers simply put alligator cracking happens.
- ↳ occurs in areas subject to the repeated traffic loadings.
- ↳ when the pavement is carrying burdens that the supporting structure can't hold up.
- ↳ As with every surface put enough pressure on the asphalt it will be cracked.

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**Block Cracking:-** The block cracking in the concrete pavement block cracking may be occur as a result in the insufficient slab thickness loss of sub-base support or subgrade settlement

- ↳ Those cracking that the crack pattern and divide pavement to the approximately rectangular pieces in the side generally larger than one foot of the crack.
- ↳ The Rectangular block range size from approximately  $0.1m^2$  to  $10m^2$
- ↳ The shrinkage of asphalt in the possible cause.

**Longitudinal Cracking:-** longitudinal cracking is cracking in the surface of road that runs of longitudinal along the pavement that can consist of a single crack or as series of parallel cracks.

- ↳ The cracks predominately parallel to pavement centerline in location the lane is significant.
- ↳ The causes of possible expansion in contraction of pavement material roadbed settlement poor construct paving joints.
- ↳ causes → Subsoil settlement
- ↳ cures → joint sealing, full depth replacement  
→ subsurface stabilization
- ↳ load due to soil cover or external loading such heavy vehical loads.
- internal pressure in the case of main ~~high~~ rising.

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### Transverse Cracking:-

Transverse Cracking an unconnected crack that runs across a road pavement perpendicular to the direction of the road.

- L> Transverse cracking are occur across to center line not due reflection cracking.
- L> The construction joint of shrinkage crack due to low temperature or bitumen hardening in asphalt surface
- L> Causes of transverse cracks and also expansion and contraction of pavement material road bed settlement poorly constructed paving joint.
- L> The reflection of a crack in joint in underlying pavement layer
- L> Causes → Slab longer than required  
→ Excessive thermal stresses.
- L> Cures → Crack Sealing  
→ full depth rigid repair  
→ Dowel bar retrofit.