Name : Muhammad Furqan
I.D : 7802
Section : A
Paper : Highway and Traffic Engineering
Semester : 6th
Instructor : Dr. NADEEM ANWAR
Page NO : 01

Question 1

Railways.

1. The transportion is provided by railway tracks to both people and goods between stations, particularly for long distance
2. It is dependent upon road transport. Road transport can serve as feeder.
3. Energy required by railway is 1/4 to 1/5 of that required by road to drag a unit load through unit distance.

4 It is Safer. Crash occurs rarely if handled carefully.

5 Requires large investment by the goverment.

Highways.

1 It Provides the maximum service to one and all.

2 It gives maximum flexibility for travel with refrence to route choice, direction, time and traveling speed.

3 Other modes are depend on it.

4 It requires small investment for the goverment.

5 Motor vehicles are cheaper than other carriers like rail engines.

6 Risk of accident is greater due to flexibility of movement.

Question 2

Being a transportation engineer, following refrences should be studied before jumping to conclusions and selection of area through which high way will traverse based on data extracted from study. I will do the following preliminary reference study:

1- Geological and Gegraphical Study:

Geographical studies give an idea about the distribution of wildlife and others environmental characteristics of a Particular area that may affect the future construction in one way or other. It also helps in minimizing the damage caused by human activity to others forms of life and environment. Geological Study provides the knowledge about the type of soil and other properties if ground that help the

transportation engineers to locate the area for their construction.

2. Map Study :

Map study provides knowledge about the pre-existing roads, traffic channels and other routes of transportation, so it helps in duplication of roads in a particular location while still deprived of modern transportation channels.
The map study includes topographic map study, road map study, climatic map study, economic and resources map study.

3. Historical and Religious Importance of a Place :

Will indicate whether any of the specific sites should be excluded from further consideration because if it is found that a site of historic and archeological importance is

located within area being considered for possible route location. it may be immediately decided that any route that traverses that site should be excluded from Furthur consideration.

4- Study of Pre-existing Information:

I will study the information and work done previously. for example the data collected about population, related problems and nearby places. I will also study traffic parameters such as traffic volume or traffic frequency that might help in better planning of the highway.

Data Extracted:

The data extracted from refrence study will help to minimize the mistakes and will drag my attention to the points which might

have slipped out of my mind. Based on reference study I will extract following data

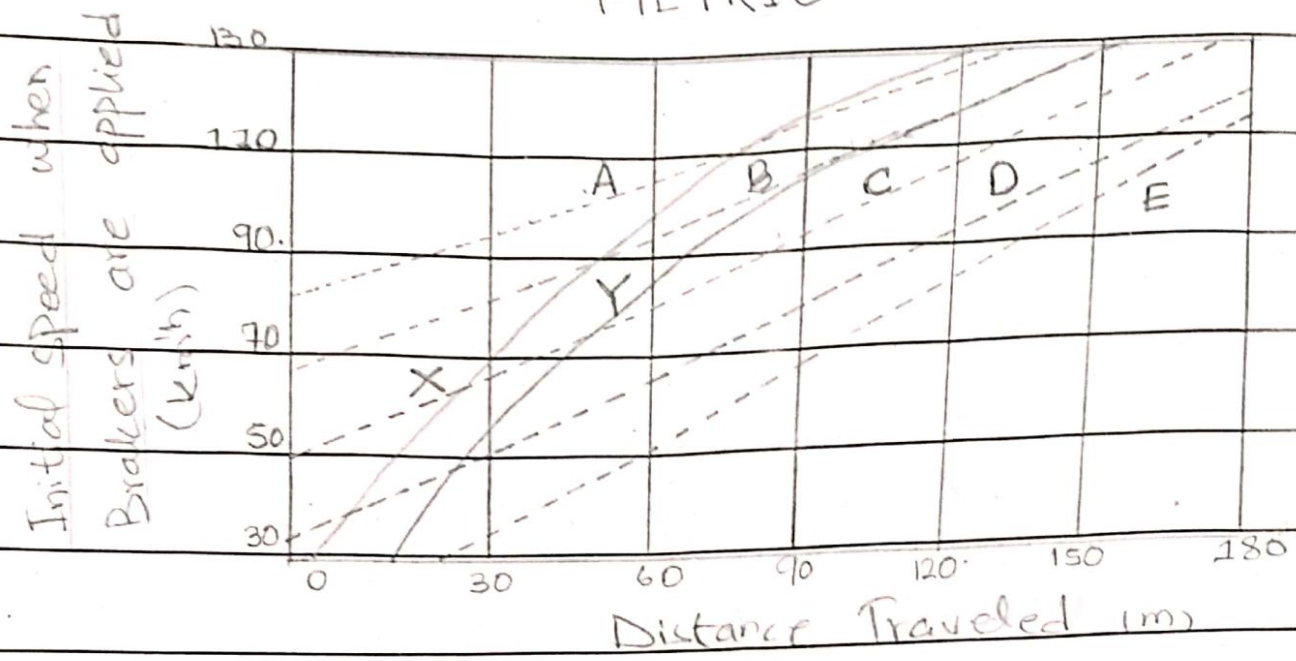
1. Whether the location is suitable or not for the future high way construction
2. Historical importance of selected site and change of plan.
3. Religious importance of selected site.
4. Prevent the duplication of roads.
5. Selection of better location based on type of land and climatic changes.
6. Plans with minimum investment and better efficacy by combing all aspects of refence studying.
7. Flooding pattern and frequency of that area.

Question 3

Vehicles performance which means Acceleration and deceleration rates of vehicles are often critical parameters in determining high way design. These rates often govern the dimensions of such designes features:

- Freeway ramps
- Climbing or passing lanes
- Turnout bays for buses
- Acceleration and deacceleration lanes
- Highway alignment (adequate passing and stopping sight distance)
- Determine the need for truck climbing lanes (steep grade)

METRIC



Speed Reached (comfortable range)

A = 80 km/h B = 60 km/h

C = 50 km/h D = 30 km/h

E = 0 km/h

Minimum Braking Distance

X = Dry Pavement Y = Wet Pavement

Question 4

Directional Distribution :—

Highways must need to be designed in such a way to adequately serve the Peak-hour traffic volume in the peak direction of flow.

- Two-lane roads are designed keeping in mind total hourly traffic in both directions
- Directional traffic is used for multilane roads and street which means that in the design of highways with more than two lanes and on two lanes roads where important intersections are encountered or where additional lanes are to be provided later, knowledge of the hourly traffic volume for each directions of travel is essential
- Typically, one direction contributes

by 55 – 70% in total traffic, although occasionally 80% is observed.

- Directional Distribution – Example, consider a rural road with a design volume of 4,000 vehicles per hour (vph) for both directions 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 percent of the DHV is in one direction, at least three lanes in each direction would be needed for the 3,200 vph.

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

$$DDHV = MDT * K(\text{Peak hr}) * D(\text{Peak dir - flow})$$

K = Proportion of daily traffic occurring during peak hours.

D = Proportion of peak hour traffic travelling in Peak direction of flow

For design, the K factor often represents the proportion of ADT occurring during 30th peak hour of the year.

Question 5

Surface distress refers to Any indication of poor or unfavorable pavement performance or it can also refer to signs of impending failure; any un satisfying performance of a pavement short of failure.

Fracture.

The fracture could be in the form of cracking (in flexible and rigid pavement) or it can be in the form of spelling, resulting from such things as excessive loading, fatigue, thermal changes, moisture damage, slippage or contraction.

Distortion.

The distortion 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.

Disintegration

The disintegration is in the form of stripping, raveling or spalling, which can result from such things as loss of bonding, chemical reactivity, traffic abrasion, aggregate degradation, poor consolidation / compaction or binder 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 structral integrity (surface distress can be a sign of impending or current structural problems.)

Page no. 14
Question 6

Alligator Cracking:

Alligator cracks are the interconnected cracks that are found on roads that are suffected to heavey traffic or sever climates.
It is called Alligator cracking because it develops into a many sided pattern that resembles chicken wire or alligator skin. It is also called field cracking, it is a combination of fatigue and block cracking.
It is series of interconected cracks of vasious stages of development.

Block Cracking:

A pattern of cracks that devides the pavement into approximatly redangular Pieces, with sides generally longer than one foot.

The size of rectangular block approximately ranges from $0.1 m^2$ to $10 m^2$. The possible cause of block cracking include shrinkage of asphalt.

Longitudinal Cracking:

The cracks that are formed in the direction of the traffic flow are termed as longitudinal cracks or, The cracks that are predominately passallel to pavement centerline. Location within the lane (wheel path versus non wheel path) is significant.

The Possible Causes of longitudinal cracking includes:

1- Expansion and Contraction of Pavement material
2- roaded settlement
3- poorly constructed paving joints.

Transverse Cracking :

The cracks that are formed perpendicular to the traffic flow are called transverse cracks or, Cracking across the centerline, not due to reflection cracking. (Reflection cracking ; cracking of overlying AC layer due to PCC joint beneath)

The possible causes include :

1. Expansion and contraction of pavement material,
2. Roaded settlement,
3. Poorly constructed paving joints.