

Name

Usama Ayaз

ID

6977

Section

A

Paper

Highway & Traffic Engineering

Teacher Name

Dr Nadeem Anwar Qureshi

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Qno 1)

Ans 1)

Railways

- The carrying capacity of the railways is extremely large. Moreover, its capacity is elastic which can easily be increased by adding more wagons.
- It is suitable for long distances
- Railway transport cannot provide door to door service as it is tied to a particular track.
- Its speed over long distances is more than any other mode of transport, except airways.
- Railway transport has in flexibility. Its route & timing cannot be adjusted to individual requirement.

Highways

- It gives maximum service to one & all
- It is more economic & quicker for carrying goods & people over short distances
- The outstanding advantage of road transport is that it provides door to door service
- The speed of motor transport is comparatively slow & limited
- Road transport has a great advantage over other modes of transport for its flexible service

Qno 2)

Ans 2) The reference materials that I will take for the design of new highway include

(1) Maps

- 2) Aerial photographs
- 3) Charts
- 4) Existing Engineering reports

The data that I will extract from these sources include the following characteristics;

- Engineering (Traffic volumes, climate geology)
- Social & demographic (Land use & zoning pattern)
- Environmental (type of wild life historic or recreational sites)
- Economic (unit cost for construction)

Q no 3)

Ans 3) Importance of Vehicals Performance in highway design.

The most critical parameter which are included in determining

highway designs ~~are~~ guideline such as

- length of acceleration & deceleration rates
- maximum grades
- stopping sight distances
- setting speed limits
- Passing sight distances
- Timing of signalized intersections
- Turn out bays for buses
- Free way ramps

The main reason we study vehicals performance in highway design is to be able to accomodate a large variety of vehical types on roads."

Qno 4)

Ans 4) Directional distribution:-

- Highways must be designed to adequately serve the peak-hour traffic volume in the peak direction of flow.
- Total hourly traffic is used in both direction to design two lane road
- In the design of highways with more than two lanes & on two lane road where important intersections are encountered or where additional lane are to be provided later. knowledge of the hourly traffic volume for each direction of flow is essential.
- Directional traffic is used for multilane roads & streets.

Normally, one direction contributes 55-70% in total traffic, although sometime 80% is observed.

Importance:-

- Accounts for the directional distribution of traffic
 - used to convert average daily traffic to directional peak hour traffic.
- Example:- Consider a rural road with a design volume of 4000 (VPH) for both direction of travel
- if during the design hour, the directional distribution is equally split, or 2000 vph in one direction, two lanes in each direction may be adequate.
 - if 80 percent of the DHV is in one direction, at least 3 lanes in each direction would be needed for the 3200 VPH.

Q no 5

Ans 5) Broad classification of surface distress modes?

Surface distress modes can be broadly classified into three groups.

(i) Fracture (ii) Distortion (iii) Disintegration.

(i) Fracture:-

This could be in the form of cracking (in flexible & rigid pavement) or spalling resulting from such things as excessive loading, fatigue or contraction etc.

(ii) Distortion:-

This is the form of deformation (e.g. rutting, corrugation & shoving) which can result from such things as excessive loading, creep, swelling or frost action.

(iii) Disintegration:-

This is in the form of stripping, raveling or spalling, which can result from such things as loss of bonding, chemical reactivity, poor consolidation or binder aging.

Q no 6)

Ans (6) Alligator Cracking:-

It is also called crocodile cracking & perhaps misleadingly fatigue cracking is a common type of distress in asphalt pavement. Alligator cracking refers to a surface damaged in such a way that the cracks form a pattern that look like reptile scales, most notably those on an alligator or crocodile back.

(b)

The pattern of Alligator cracking usually begins with longitudinal cracking, which are then connected by transverse cracks. These create geometric shapes that are normally interconnected and which can spread over a wide area in a relative brief period.

Prevention & Repair:-

Alligator cracking is one of the most serious issue that can affect an asphalt surface. It is one of the most costly problems to repair, but it is also preventable in most cases. Assuming that the initial installation was correctly performed. Alligator cracking is almost always the result of neglecting to make needed repairs & protect the surface with a sealant.

(2) Block cracking:-

Block cracking is a series of large (typically one foot or more) rectangular cracks on an asphalt pavement surface. This type of cracking typically cover large area & may occur in area where there is no traffic.

Causes:-

shrinkage & daily temperature cycling typically caused by an inability of asphalt binder to expand & contract with temperature cycles because of

- Asphalt binder aging
- Poor choice of asphalt binder in mix design.

Repair

strategies depend upon the severity & extent of the block cracking

- Low severity cracks ($< \frac{1}{2}$ inch wide): Crack seal to
 - Prevent entry of moisture into the subgrade through the crack & further raveling of the crack edges can provide year of satisfactory service after developing small cracks if they are kept sealed
- High severity cracks ($> \frac{1}{2}$ inch wide & cracks with ravelled edges)
 - Remove & Replace the crack pavement layer with an overlay.

3) Longitudinal Cracking:-

cracks parallel to the pavement centerline or laydown direction

Causes :-

- The reflection of a crack or joint in the road pavement
- Poorly constructed joints in the asphalt surface
- Asphalt hardening
- diurnal temperature fluctuations.
- An expensive clay subgrade
- A cyclical weakening of the pavement edges
- Differential settlement in cut & fill

- Repair:-
- Joint sealing
 - Full depth replacement
 - subsurface stabilization.

4) Transverse Cracking:-

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

Causes:-

- The reflection of a crack or joint in an underlying pavement layer.
- A construction joint of shrinkage crack (due to low temperature or bitumen hardening) in an asphalt surface.
- The structural failure of a concrete base course

Repair:-

- Crack sealing
- Full depth rigid repair
- Dowel bar retro fit.