

Branch: Civil Engineering

- i) Use separate Answer script for each half.  
ii) Assume data reasonably, if required

Time: 3 hours

Full Marks: 100

**FIRST HALF**

(Answer Q.No.1 and any TWO from the rest)

1. Write short notes on any **four** : (5 X 4 = 20)
- a) Speed-Flow-Density relationship of a traffic stream.
  - b) Rotary intersection
  - c) Necessity of Highway Planning
  - d) Classification of urban road
  - e) Road user characteristics
  - f) Spot Speed
2. (a) Calculate the superelevation to be provided for a horizontal curve with a radius of 350 m. The road is designed with 100 km/hr. speed and situated in plain terrain. Also determine the allowable speed at this curve.
- (b) Describe with neat sketch the method of attainment of superelevation for the above problem (8+7 = 15)
3. (a) What is known as camber? What are the different factors on which road camber depends? (1+2 = 3)
- (b) Describe the factors on which the overtaking sight distance depends. Why are overtaking zones provided? (2+2 = 4)
- (c) In a mountainous terrain, a circular curve of radius 50m. and a length 40m has transition 20m on both ends. Calculate the extra widening required if the design speed is 30 km/hr. Suggest suitable method of providing the widening of two-lane pavement. Assume the length of wheel base is 6m. (6+2 = 15)
4. (a) A valley curve joins a  $-1/200$  grade to a  $+1/100$  grade. Design the valley curve for a single lane road; design speed 80 km/hr and head light sight distance criteria. If the chainage and elevation of the start point of the valley curve is 74+50 and 59m. from mean sea level respectively then find out the chainage and elevation of the Point of Intersection of the two tangents (P.I.) (7+3 = 10)
- (d) Show with neat sketch the different types of conflict points for a 4-leg intersection of two lane two way traffic (5)



**SECOND HALF**

(Answer Q.No 5 and any TWO from the rest)

5

Write short notes on any *five*:

(5 X 4 = 20)

- (a) Joints on cement concrete pavements
- (b) Sheet Asphalt and Mastic Asphalt
- (c) Component of flexible pavement and their functions
- (d) Penetration Test for Bitumen
- (e) Warping stress in rigid pavement
- (f) Modulus of Subgrade reaction and radius of relative stiffness
- (g) Vehicle Damage Factor

6

Explain the construction procedure of WBM Roads in steps. Give the detailed specification of course aggregates and screening used for such roads. What are the drawbacks of such construction? (15)

7

(a) Two soil samples were collected for use as possible fill materials for making subgrade of a road. For the first soil sample, Plastic limit was 13% while P.I. was 33%, Grain size distribution of the soil indicated presence of 55% fine. For the second soil sample, P.L was 18% and L.L. was 58% while percentage finer than the 75 micron was 75%. Evaluate the group index for the two soils and comment on their suitability as subgrade material. (9)

(b) Describe Loss Angles Abrasion Test in detail. Give the permissible values of abrasion test for cement concrete pavement and also for bituminous road (7)

8

(a) Explain various methods of constructing cement concrete pavement. (7)

(b) Determine the edge load stress for a typical rigid pavement at the following condition

Design wheel load – 6000 kg.

Tyre pressure - 75 kg/cm<sup>2</sup>

Modulus of subgrade reaction – 6kg/cm<sup>3</sup>

Poisson Ratio - 0.15

'E' for concrete – 3 X 10<sup>5</sup> kg/cm<sup>2</sup>

Thickness of the pavement - 20 cm. (8)