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10CV755

Seventh Semester B.E. Degree Examination, April 2018
Highway Geometric Design

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. What is a design vehicle? Indicate the IRC and AASHTO standards of a design vehicle. **(06 Marks)**

b. Explain the pavement surface characteristics indicating the IRC specifications. **(06 Marks)**

c. A one was city street has the following traffic count per hour during peak hour. Find the traffic in terms of equivalent passenger car units at i) mid block section ii) signalized intersection iii) kerbed parking.

Vehicle	Number
Truck	200
Bus	400
Car	1000
Scooter	1000
Bicycle	1000

(08 Marks)

2 a. What are the objectives of providing camber? Indicate the IRC specifications of camber for different pavement surfaces. **(06 Marks)**

b. What are the requirements of a road hump? Sketch the details of typical road hump. **(06 Marks)**

c. Explain the various road margins. **(08 Marks)**

3 a. Explain how the sight distance at an uncontrolled intersection is determined. **(06 Marks)**

b. Derive the equation for calculating over taking sight distance on a two lane two way traffic highway, as per IRC approach. **(06 Marks)**

c. Calculate the overtaking sight distance as per AASHTO practice for a design speed of 100 kmph making suitable assumptions. Compare this with OSD calculated from IRC approach. **(08 Marks)**

4 a. Derive the equation to determine super elevation at a horizontal highway curve. **(06 Marks)**

b. A national highway passing through flat terrain has a horizontal curve of radius equal to the ruling minimum radius. If the design speed is 100 kmph, calculate length of transition curve. **(08 Marks)**

c. A six lane divided highway has a curve 1000m long with radius 500m. The SDD is 200m. Calculate the minimum setback distance from the inner edge of the road to the inner edge of a building to ensure safe visibility. The width of pavement per lane is 3.5m. **(06 Marks)**

PART – B

5 a. With sketches indicate the circumstances in which a summit curve is formed. **(06 Marks)**

b. Derive the equation to calculate the length of valley curve for comfort condition. **(06 Marks)**

c. An ascending gradient of 2% meets a descending gradient fo 1.25%. Determine the length of summit curve so as to provide intermediate sight distance, for a design speed of 80 kmph. Assume all other data suitable as per IRC. **(08 Marks)**

6 a. What are the requirements of an atgrade intersection? **(06 Marks)**

b. Differentiate between unchannelized and channelized intersections. Indicate the advantages of channelized intersections. **(06 Marks)**

c. With sketches indicate :
   i) Traffic maneuvers at an atgrade intersection
   ii) Types of at grade intersections. **(08 Marks)**

7 a. Describe the important features of :
   i) Clover leaf intersection
   ii) Half clover leaf intersection
   iii) Diamond intersection. **(08 Marks)**

b. Traffic flow in an urban section at the intersection of two highways in the design hour are given below . The highways intersect and 90° and have carriage way width of 15m. Design a rotary intersection making suitable assumptions. Assume design speed = 30 kmph, radius of entry curve = 20m, radius of exit curve = 40m, weaving length = 55mm PCU of car = 1, CV = 2.8 and TW = 0.75.

Approach	Left turning			Straight ahead			Right turning		
	Cars	CV	TW	Cars	CV	TW	Cars	CV	TW
N	200	50	100	250	100	150	150	50	80
E	180	60	80	220	50	120	200	40	120
S	250	80	100	150	50	90	160	70	90
W	220	50	120	150	60	100	250	60	100

(12 Marks)

8 a. What are the requirements of a good highway drainage system? **(06 Marks)**

b. Explain with a sketch, how underground drainage is affected through lowering of ground water table. **(06 Marks)**

c. The design quality of water expected to flow in an open drain is $0.7 m^3/sec$. Design the cross section and slope of drain assuming velocity of flow as 0.9m/sec and Manning's coefficient as 0.025. **(08 Marks)**

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