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10CV56

Fifth Semester B.E. Degree Examination, June/July 2017
Transportation Engineering – I

Time: 3 hrs. Max. Marks:100

Note: 1. ***Answer FIVE full questions, selecting at least TWO questions from each part.***
2. ***Assume Missing data suitably***
3. ***Use of tables and charts extracted from IRC 37-2001 and IRC 58-2002 is permitted.***

PART – A

1 a. Explain the role of transportation for the development of rural areas in India. **(06 Marks)**

b. What are the significant recommendations of Jayakar committee? How they are implemented? **(08 Marks)**

c. What are the various characteristics of road transport? **(06 Marks)**

2 a. What are the methods of classification of roads? Mention their respective classification of road. **(06 Marks)**

b. What are the different studies made in planning surveys? What are the typical drawing are prepared in the form of plans by analyzing the planning survey datas? **(06 Marks)**

c. The area of a certain district in India is 13400Sq Km and there are 12 towns as per 1981 census. Determine the lengths of different categories of roads to be provided in this district by the year 2001. **(08 Marks)**

3 a. What is the necessity of re-alignment? What are the different types of improvement made by re-alignment of highway? **(06 Marks)**

b. Draw the typical cross section of following roads with full details :
   i) Cross section of two lane city road in built up area
   ii) Cross section of divided highway in urban area. **(06 Marks)**

c. The speeds of overtaking and over taken vehicles are 70 and 40kmph respectively on a two way traffic road the average acceleration during overtaking may be assumed as 0.99 m/sec^2.
   i) Calculate safe overtaking sight distance
   ii) What is the minimum length of overtaking zone?
   iii) Draw a neat sketch of the overtaking zone and show the positions of the sign post. **(08 Marks)**

4 a. What are the objects of providing transition curves on the horizontal alignment highways? How its length is calculated by the method of rate of change of centrifugal acceleration? **(08 Marks)**

b. Find the total width of a pavement on horizontal curve for a new national highway to be aligned along a holling terrain with a minimum ruling radius. Assume necessary data. **(06 Marks)**

c. A vertical summit curve is formed at the intersection of two gradients +3.0 and -5.0 percent. Design the length of summits curve to provide a stopping sight distance for a design of 80kmph. Assume other data. **(06 Marks)**

PART – B

5 a. Explain how the C.BR value of the given soil is found in the laboratory. **(08 Marks)**

b. A plate load test was conducted on a soaked subgrade during monsoon season using a plate diameter of 30cm. The test values are given below. Determine the modulus of subgrade reaction for the standard plate. **(06 Marks)**

Mean settlement values in mm	0.0	0.24	0.52	0.76	1.02	1.23	1.53	1.76
Load values in kg	0.0	460	900	1180	1360	1480	1590	1640

c. What are the tests conducted to judge the desirable properties and suitability of the following highway materials i) Road aggregates ii) Bitumen binder. **(06 Marks)**

6 a. Explain E.S.WL. How it is determined for a dual wheel load assembly by graphical method? **(06 Marks)**

b. Calculate the stresses at interior, edge and corner region of a cement concrete pavement using Westergaard's stress equations and also determine the probable location where the crack is likely to develop due to corner loading.
Wheel load P = 5100kg
Modulus of elasticity of cement concrete E = 3.0×10^5 kg/cm^2.
Pavement thickness h = 18cm
Poisson's ratio of concrete $\mu = 0.15$
Modulus of subgrade reaction K = 6.0kg/cm^3
Radius of contact area a = 15cm **(08 Marks)**

c. Design the flexible pavement for construction of new highway with the following data :
Number of commercial vehicles as per
Period of construction = 3 years
Initial traffic = 3500CV per day
Annual traffic growth rate = 6.5%
Category of road N.H 2 lane single carriage way.
Design life 15 years
VDF = 40, LDF = 75%
Use the following pavement design catalogue for 10% CBR ; sketch the pavement structure

Cumulative traffic (msa)	Total pavement thickness (mm)	Pavement		Composition
		Bituminous surfacing		Granular base and sub base (mm)
		BC (mm)	DBM (mm)	
10	540	40	50	Base 250 sub base 200
20	565	40	75	
30	580	40	90	
50	600	40	110	
100	630	50	130	
150	650	50	150	

(06 Marks)

7 a. What are the steps followed for the construction of new highway on cutting. **(06 Marks)**

b. What are the importances of highways drainage? **(06 Marks)**

c. The maximum quantity of water expected in one of the open longitudinal drainage on clayey soil is 0.9m^3/sec design the cross section and longitudinal slope of trapezoidal drain assuming the bottom width of the section to be 1.0m and cross slope to the 1.0 vertical to 1.5 horizontal. The allowable velocity of flow in the drain is 1.2m/sec and mannings roughness coefficient is 0.02. **(08 Marks)**

8 a. What are the benefits to the road users and to other in the region due to improvement of the highway? **(08 Marks)**

b. Calculate the annual cost of a stretch of highway from to following particulars :

Item	Total cost in Lakhs Rs	Estimated life years	Rat of interest %
Land	35.0	100	6
Earthwork	40.0	40	8
Bridges culverts Drainage	50.0	60	8
Pavement	100.0	15	10
Traffic signs and road appetencies	15.0	5	10

The average cost of maintenance of the road is Rs 1.5 lakhs per year. **(06 Marks)**

c. What are the factors to the considered for evaluation of vehicle operation cost? **(06 Marks)**