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10CV56

Fifth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Transportation Engineering – I

Time: 3 hrs.

Max. Marks:100

Note: 1. Answer any FIVE full questions, selecting atleast TWO questions from each part.
2. Use of IRC : 37 – 2001 is permitted.

PART – A

- 1 a. Discuss briefly the role of transportation in the economic social activities of the country. (06 Marks)
- b. Explain the following :
 - i) Jayakar committee's recommendations
 - ii) IRC
 - iii) CRF. (06 Marks)
- c. The area of state is 3,08,000 sq. km. The number of towns as per 1981 census was 276. The number of villages were 41,833. Calculate the length of various categories of roads as per 3rd 20 year road plan formulae. (08 Marks)
- 2 a. Briefly describe highway planning surveys. (06 Marks)
- b. List the salient features of : i) PMGSY ii) KSHIP projects. (06 Marks)
- c. Four new roads A, B, C and D are to be constructed in a district during a five year plan period. Suggest the order of priority for phasing the development programme based on maximum utility approach. Assume utility units of 0.5, 1, 2 and 4 for population ranges and 1 and 10 for 1000 t of agricultural and industrial products.

Road	Length km	Number of villages with population range				Productivity, t	
		<500	500-1000	1000-2000	>2000	Agricultural	Industrial
A	65	40	12	14	8	5000	1000
B	55	22	9	6	4	8000	1200
C	45	32	8	9	6	6000	800
D	72	36	6	3	3	9000	2000

- 3 a. Briefly explain the factors controlling highway alignment. (06 Marks)
- b. Explain with neat sketch the width of carriage way and mention the IRC standards. (06 Marks)
- c. Two vehicles A and B are moving in the same direction with speeds of 100 kmph and breaking efficiency of 70% and 50% respectively. An object is seen by both the drivers on the road approximately at a distance of 250m. Find :
 - i) Which vehicle will meet with an accident
 - ii) If the accident is to be avoided, what is the breaking efficiency required? (08 Marks)
- 4 a. Explain briefly the attainment of designed super elevation in practice. (06 Marks)
- b. A NH passing through a plain terrain has a horizontal curve of radius equal to the ruling minimum radius. If the design speed is 100 kmph. Calculate the : i) design super elevation ii) Extra widening iii) Length of transition curve. Make suitable assumptions. (08 Marks)
- c. An ascending gradient of 1 in 50 meets with a descending gradient of 1 in 80. Calculate the length of the summit curve for SSD of 120m and OSD of 470m. (06 Marks)

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PART – B

- 5 a. Briefly explain the desirable properties of sub grade soil. (06 Marks)
 b. Explain the desirable properties of road aggregates. Indicate the test conducted to determine these properties. (06 Marks)
 c. The following test data pertains to a soil sub-grade specimen. Plot the data and determine the CBR value :

Penetration (mm)	0	0.5	1.0	1.50	2.0	2.5	3.0	4.0	5.0	7.5	10.0	12.5
Load (kg)	0	5	16.2	28.1	40	48.5	56.5	67.5	75.2	89.0	99.5	106.5

(08 Marks)

- 6 a. Briefly explain the design factors to be considered in pavement design. (06 Marks)
 b. Explain the following terms
 i) Modulus of subgrade reaction
 ii) Radius of relative stiffness
 iii) Equivalent radius of resisting section. (06 Marks)
 c. Design the flexible pavement for construction of a new highway (NH/ Two lane /Single carriageway) with the following data as per IRC: 37-2001 :
 i) Number of commercial vehicles as per last count = 1000 CVPD
 ii) Period of construction = 3 years
 iii) Design life = 15 years
 Annual growth rate = 8% . Design CBR of sub-grade soil = 6%

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(08 Marks)

- 7 a. Explain the construction step for cement concrete roads. (10 Marks)
 b. Explain the methods of sub-surface drainage to control the seepage flow, capillary rise and water table. (10 Marks)
 8 a. Explain the various benefits that a road user gets by the improvement of road. (06 Marks)
 b. Briefly explain the factors to be considered for evaluating the motor vehicle operating cost. (06 Marks)
 c. Determine the relative economics of two type of flexible pavements by annual cost method from the following data :

Details	Pavement type A	Pavement type B
Total cost per km, Rs. lakhs	3.30	6.20
Design life, years	5.00	12.00
Annual rate of interest, %	10.00	9.00
Salvage value after design life, Rs. Lakhs	2.10	3.00
Average annual maintenance cost per km, Rs. lakhs	0.40	0.20

(08 Marks)
