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Fifth Semester B.E. Degree Examination, May/June 2010
Transportation Engineering - I

Time: 3 hrs.

Max. Marks:100

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

PART - A

- 1 a. Discuss briefly the role of transportation in the development of a country. (06 Marks)
- b. List and explain briefly the recommendations of Jayakar committee. (06 Marks)
- c. Determine the length of different categories of roads in a state in India for the year 2001, using the following data : (08 Marks)
The area of the state = 1,80,000 km², Total number of towns as per 1981 census = 175.
- 2 a. Briefly explain the requirements of an ideal highway alignment. (06 Marks)
- b. Explain briefly the various surveys to be conducted for the alignment of a highway. (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, 1.0, 2.0 and 4.0 for population ranges and 1.0 and 10.0 for 1000 T of agricultural and industrial products. (08 Marks)

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. List the factors affecting the friction. Explain any one, briefly. (06 Marks)
- b. Define SSD. Explain any one factor that restricts the SSD. (06 Marks)
- c. The speeds of overtaking and overtaken vehicles are 96 kmph and 80 kmph. Assuming an acceleration of 2.5 kmph/sec and driver's reaction time of 2 secs, find the OSD and draw a neat sketch of overtaking zone. (08 Marks)
- 4 a. Explain, with the help of a sketch, the effect of centrifugal force on a vehicle negotiating a horizontal curve. (06 Marks)
- b. Explain briefly the attainment of designed super elevation in practice. (06 Marks)
- c. A summit curve is formed when an ascending gradient of 1 in 25 meets another ascending gradient of 1 in 100. Find the length or summit curve to provide the required SSD for a design speed of 80 kmph. (08 Marks)

PART - B

- 5 a. Briefly explain the desirable properties of sub grade soil. (06 Marks)
- b. Explain briefly, how CBR value of given soil is determined. (06 Marks)
- c. Explain briefly the desirable properties of road aggregates. Mention the laboratory tests conducted to determine the property. (08 Marks)
- 6 a. Briefly explain the design factors to be considered in pavement design. (06 Marks)
- b. Explain the design steps for the design of flexible pavement using CSA method. (06 Marks)

- 6 c. Calculate the stresses at interior, edge and corner of a cement concrete pavement using Westergaard's stress equations, use the following data:
Wheel load, $p = 4100$ kg, pavement thickness, $h = 18$ cm, modulus of elasticity of CC, $E = 3 \times 10^5$ kg/cm². Poisson's ratio of concrete, $\mu = 0.15$. Modulus of subgrade reaction, $K = 6$ kg/cm³. Radius of contact area, $a = 15$ cm. (08 Marks)
- 7 a. Explain briefly the design elements considered in highway embankment. (06 Marks)
b. Explain the construction procedure for bituminous macadam road. (06 Marks)
c. With the help of a neat sketch, explain how the sub surface drainage system is provided to lower the ground water table. (08 Marks)
- 8 a. Explain the various benefits that a road user gets by the improvement of a road. (06 Marks)
b. Mention the types and causes of failures in flexible pavement. (06 Marks)
c. Compare the annual costs of two types of pavement structures:
i) WBM with thin bituminous surface at total cost of Rs. 2.2 lakhs per km, life of 5 years, interest at 10%, salvage value of Rs. 0.9 lakhs after 5 years, annual average maintenance cost of Rs. 0.35 lakhs per km and
ii) Bituminous macadam base and bituminous concrete surface, total cost of Rs. 4.2 lakhs per km, life of 15 years, interest at 8%, salvage value of Rs. 2.0 lakhs at the end of 15 years ; annual average maintenance cost of Rs. 0.25 lakhs per km. (08 Marks)

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