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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

February / March 2023 Semester End Main Examinations

Programme: B.E. **Semester: V**
Branch: Civil Engineering **Duration: 3 hrs.**
Course Code: 20CV5PCTRE **Max Marks: 100**
Course: Transportation Engineering - I **Date: 23.02.2023**

Instructions:

1. Answer Any FIVE Full Questions choosing ONE question from each Unit
2. Missing data may be assumed suitably.
3. Provide IRC 37 charts (CBR charts)

UNIT - I

1 a) Discuss the role of transportation in the economic and social activities of the country. **05**

b) Fix up the priority for the roads shown below. Assume utility units of 0.5, 1, 2 and 4 for the four population ranges and 2, 2 and 5 units per 1000t of agricultural, raw material and industrial products from the following data. **10**

Road link	Length km	No. of villages served with population range				Productivity served, t		
		<500	501-1000	1001-2000	>2000	Agricultural	Raw material	Industrial product
A	75	30	15	10	3	8000	3000	1000
B	35	20	8	6	3	5000	1000	1600
C	40	15	6	5	5	6000	2000	3200
D	50	40	4	3	2	3000	7000	500

c) A new State Highway has been planned from Hassan to Chikkamagaluru. Briefly explain the engineering surveys carried for highway location. **05**

UNIT - II

2 a) For the new highway constructed from Davangere to Mysuru having a design speed of 100 kmph. Find the safe Overtaking Sight Distance by assuming the data suitably. **08**

b) A national highway passing through rolling terrain in heavy rainfall area has a horizontal curve of radius 500m. Design the length of transition curve assuming suitable data. **12**

OR

3 a) A vertical summit curve is to be designed when two grades, +1/50 and -1/80 meet on a highway. The SSD and OSD required are 180 and 640m respectively. But due to site conditions the length of vertical curve has to be restricted to a maximum value of 500m if possible. Calculate the length of summit curve needed to fulfil the requirements of (a) SSD (b) OSD or ISD and discuss the results. **10**

b) Explain the factors affecting the road traffic. **05**

c) Calculate the extra widening required for a pavement of width 7.0 m on a horizontal curve of radius 500m if the longest wheel base of vehicle expected on the road is 6.5m and design speed is 70 kmph. **05**

UNIT - III

4 a) Explain the desirable properties of bituminous material. **06**

b) Differentiate between Flexible pavement and Rigid pavement. **06**

c) Discuss the factors affecting design and performance of pavements. **08**

OR

5 a) Design the pavement for construction of a new flexible pavement with the following data: **12**

(i) Four lane divided carriageway
(ii) Initial traffic in the year of completion of construction = 5600 CVPD (Sum of both directions)
(iii) Traffic growth rate per annum = 6.5 per cent
(iv) Design life = 15 years
(v) Vehicle damage factor = 4.8 (Based on axle load survey)
(vi) Effective CBR of subgrade soil = 7%
(vii) Marshall mix design carried out on the bituminous mix to be used in the bottom bituminous layer (DBM) for an air void content of 3 % resulted in an effective bitumen content (by volume) of 11.5%.

b) Discuss the factors considered in the design of pavements briefly. **08**

UNIT - IV

6 a) Explain with step by step procedure for the construction of bituminous concrete layer along with quantity control tests carried out during the construction process. **10**

b) Explain with step by step procedure for the construction of cement concrete pavement slab along with quantity control tests carried out during the construction process. **10**

UNIT - V

7 a) Mention the causes of distress in rigid pavements. **05**

b) The maximum quantity of water expected in one of the open longitudinal drains on clayey soil is $0.9m^3$/sec. Design the cross section and longitudinal slope of trapezoidal drain assuming the bottom width of the trapezoidal section to be 1.0m and cross slope to be 1.0 V to 1.5 H. The allowable velocity of flow in the drain is 1.2 m/sec and Manning's roughness coefficient is 0.02. **10**

c) Discuss the improvements in highway which results in the benefits to the road users. **05**

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