U.S.N.										

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

Autonomous Institute Affiliated to VTU

September / October 2024 Supplementary Examinations

Programme: B.E. **Semester: V**
Branch: Civil Engineering **Duration: 3 hrs.**
Course Code: 22CV5PCHWE **Max Marks: 100**
Course: Highway Engineering

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

			UNIT - I	*CO*	*PO*	Marks
1	a)		Discuss briefly fact-finding surveys and preparation of plans.	*CO1*	*PO1*	**06**
	b)		Discuss obligatory points controlling highway alignment with sketches.	*CO1*	*PO1*	**06**
	c)		Discuss the scope of highway Engineering in India.	*CO1*	*PO1*	**08**
			UNIT - II			
2	a)		Calculate the safe passing sight distance for a design speed of 80 kmph. The average acceleration may be assumed as 3.28 kmph/sec.	*CO2*	*PO2*	**06**
	b)		In a practical scenario, how might you apply different methods to provide super elevation based on road design requirements?	*CO2*	*PO1*	**06**
	c)		A valley curve is formed by a descending gradient of 1 in 40 which meets an ascending gradient of 1 in 30. Design the total length of valley curve if the design speed is 100 kmph so as to fulfil both comfort condition and head light sight distance for night driving, after calculating the SSD required.	*CO2*	*PO2*	**08**
			OR			
3	a)		Enumerate the factors governing the width of carriageway. State the IRC specifications for width of carriageway for various classes of road	*CO2*	*PO1*	**06**
	b)		Discuss the various gradients that can be provided in vertical curves for a highway.	*CO2*	*PO1*	**04**
	c)		A National Highway passing through a rolling terrain has a horizontal curve of radius equal to the ruling minimum radius. If the design speed is 80kmph, calculate absolute minimum sight distance, superelevation, extra widening and length of transition curve. Assume necessary data suitably.	*CO2*	*PO2*	**10**
			UNIT - III			
4	a)		Describe the key differences in the design approach between flexible and rigid pavements.	*CO3*	*PO1*	**08**

		b)	Design the flexible pavement for construction of new highway for the following data, as IRC: 37. No of commercial vehicles as per last count= 1000 CVPD, Period of construction = 3 years, Annual growth rate = 7.5%, Design CBR of soil = 10 %, Category of road =NH, two lane single carriage way, Design life =10 years, VDF= 3.5, LDF = 0.75. Calculate the overall thickness using pavement design catalogue given in table.	*CO3*	*PO3*	**12**

Cumulative traffic(msa)	Total pavement thickness(mm)	Pavement composition	Pavement composition	Granular base and sub base(mm)
		BC(mm)	DBM(mm)	
10	540	40	50	Base = 250
20	565	40	75	
30	580	40	90	Sub base = 200
50	600	40	110	

		OR			
5	a)	Summarize the guidelines provided by the Indian Road Congress (IRC) for flexible pavement design by CBR method of cumulative Standard Axles.	*CO3*	*PO1*	**06**
	b)	A CC pavement slab of thickness 20 cm is constructed over a granular base having K as 15 kg/cm^3. The temperature difference was found to be 18˚C and 12°C during day and night respectively. C_x and C_y were found to be 1.02 and 0.87. Calculate the warping stress at edge and corner regions of the slab. Also find the frictional stress. E=3x10^{5}kg/cm^2; e=10x10^{-6} per ˚C; a=15cm; Slab length=4.5m, f=1.1. Assume any missing data suitably.	*CO3*	*PO1*	**08**
	c)	Describe the key benefits of using white topping as a surface layer in pavement construction.	*CO3*	*PO1*	**06**
		UNIT - IV			
6	a)	Describe the process involved in the construction of stabilized roads using Cement Treated Base (CTB) and Cement Treated Sub-Base (CTSB).	*CO4*	*PO1*	**06**
	b)	Evaluate the suitability of Full Depth Reclamation (FDR) pavement for a particular road rehabilitation project.	*CO4*	*PO2*	**08**
	c)	Compare the construction methods of bituminous pavements and cement concrete roads in terms of durability and maintenance.	*CO4*	*PO2*	**06**
		UNIT - V			
7	a)	How do the causes of distresses vary and what implications does this have on maintenance strategies?	*CO4*	*PO1*	**06**
	b)	Discuss how environmental factors contribute to distress in both flexible and rigid pavements.	*CO4*	*PO1*	**08**
	c)	Describe the role of economic analysis in decision-making for highway projects using different methods.	*CO4*	*PO1*	**06**

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