U.S.N.										

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

Autonomous Institute Affiliated to VTU

June 2025 Semester End Main Examinations

Programme: B.E. **Semester: V**

Branch: Civil Engineering **Duration: 3 hrs.**

Course Code: 23CV5PCHEN / 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.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

			UNIT - I	CO	PO	Marks
1	a)		List the characteristics of road transport.	CO1	PO1,2	**4**
	b)		Describe the framework of different studies involved in planning surveys.	CO1	PO1,2	**8**
	c)		Decide the priority of roads A and B for phasing a road development plan. Assume utility of 1, 2 and 4 units for three groups of village served and 0.1 unit per ton of agricultural products served.	CO1	PO1,2	**8**

Road	Length, km	No. of villages served with population range			Agri. Products served (tonnes)
		< 2000	2001 to 5000	Above 5000	
A	9	15	4	1	150
B	15	20	5	2	180

			OR			
2	a)		Enumerate the scope of highway engineering.	CO1	PO1,2	**6**
	b)		Classify roads based on third 20-year road development plan.	CO1	PO1,2	**7**
	c)		Describe the evolution of Rural Road Development Plan in India.	CO1	PO1,2	**7**
			UNIT - II			
3	a)		Explain the factors governed by right of way.	CO2	PO1,2,3	**6**
	b)		Define i. Ruling gradient; ii. Limiting gradient; iii. Exceptional gradient.	CO2	PO1,2,3	**6**

	c)	Calculate the minimum sight distance on a highway with a design speed of 80 kmph at a descending gradient of 6 %.	*CO2*	*PO1,2,3*	**8**
		OR			
4	a)	Describe various elements forming the road margins.	*CO2*	*PO1,2,3*	**6**
	b)	Enumerate the factors affecting overtaking sight distance.	*CO2*	*PO1,2,3*	**6**
	c)	Calculate the super elevation required for a road 7.5 m wide on a curve of 240 m radius for a permissible speed of 80 kmph.	*CO2*	*PO1,2,3*	**8**
		UNIT - III			
5	a)	Elaborate on the factors influencing design of pavements.	*CO4*	*PO1,2,3*	**6**
	b)	Highlight on the design considerations of thin white topping as per IRC SP 76 - 2015 recommendations.	*CO4*	*PO1,2,3*	**6**
	c)	A plate load test was conducted on a soaked subgrade during monsoon season using a plate diameter of 30 cm. The load values corresponding to the mean settlement dial readings are given below. Determine the modulus of subgrade reaction for the standard plate. Mean settlement values, mm: 0.0, 0.27, 0.51, 0.77, 1.01, 1.27, 1.54, 1.77 Load, kg: 0.0, 530, 1000, 1280, 1520, 1610, 1710, 1830	*CO3*	*PO1,2*	**8**
		OR			
6	a)	Explain the key principles behind Mechanistic-Empirical Pavement Design approach.	*CO4*	*PO1,2,3*	**6**
	b)	Identify a laboratory test to determine whether a bitumen sample is oxidized. Outline the procedure as specified in the IS code.	*CO3*	*PO1,2*	**6**
	c)	Using the data given below, calculate the wheel load stresses at interior, edge and corner regions of a cement concrete pavement using Westergaard's stress equations. Wheel load = 8100 kg; Modulus of elasticity of cement concrete = 3.0x105 kg/cm^2; pavement thickness = 18.5 cm; Poisson's ratio of concrete = 0.15; Modulus of sub-grade reaction = 6.0 kg/cm^3; Radius of contact area = 15 cm;	*CO4*	*PO1,2,3*	**8**
		UNIT - IV			
7	a)	Write short notes on – (i) CTB (ii) FDR	*CO4*	*PO1,2,3*	**10**
	b)	Describe the step-by-step procedure for constructing dense bituminous macadam.	*CO4*	*PO1,2,3*	**10**
		OR			
8	a)	With a neat sketch explain joints in cement concrete pavements.	*CO4*	*PO1,2,3*	**10**

		b)	Describe the step-by-step procedure for constructing granular sub base.	*CO4*	*PO1,2,3*	**10**
			UNIT - V			
	9	a)	Enumerate the requirements of highway drainage. Explain any one method of sub- surface drainage system.	*CO4*	*PO1,2,3*	**10**
		b)	Write short notes on NPV, IRR.	*CO1*	*PO1,2*	**10**
			OR			
	10	a)	Explain the design criteria for filter material in highway drainage, considering permeability and piping ratios.	*CO4*	*PO1,2,3*	**10**
		b)	With neat sketches explain different types of flexible pavement distresses.	*CO4*	*PO1,2,3*	**10**

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