U.S.N.										

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

Autonomous Institute Affiliated to VTU

July 2024 Semester End Main 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.

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.

			CO	PO	Marks
		UNIT - I			
1	a)	List the principles of Re-Alignment for a highway.	*CO1*	*PO1*	**06**
	b)	Determine the lengths of different categories of roads in a state in India by the year 2001, using the third twenty year road development plan formula and the following data: Total area of the state=78500 sq.km; Total number of towns as per 1981 census=83; Overall density aimed at : 84 km per 100 sq.km area.	*CO1*	*PO1*	**08**
	c)	Enumerate the obligatory points controlling highway alignment.	*CO1*	*PO1*	**06**
		UNIT - II			
2	a)	Define with notations: i)Camber ii)Non-Passing Sight Distance iii)Transitition curve iv)Extra Widening at curves	*CO2*	*PO1*	**08**
	b)	A State highway passing through a rolling terrain has a horizontal curve of radius equal to the ruling minimum radius. Design all the geometric features of this horizontal curve assuming suitable data as per IRC specifications.	*CO2*	*PO1,4,8*	**08**
	c)	List the IRC specifications for providing Camber for different categories of roads.	*CO2*	*PO1,8*	**04**
		OR			
3	a)	List the Pavement surface characteristics and discuss them briefly.	*CO2*	*PO1*	**08**
	b)	A valley curve is formed by a descending gradient of 1 in 40 which meets an ascending gradient of 1 in 30. Design the length of valley curve if the design speed is 95 kmph so as to fulfill both comfort condition and headlight sight distance conditions after calculating SSD required. Also find the position of the lowest point of the valley curve to locate a culvert.	*CO2*	*PO1,4*	**12**

			UNIT - III			
	4	a)	List the tests conducted on Sub-grade soil and Discuss them as per laboratory procedure for the design of pavement.	*CO3*	*PO1,4,8*	**10**
		b)	Calculate the stresses at different regions of a cement concrete pavement using Westergaard's stress analysis for the given data: Wheel load=5100 kg E=3 x 105 kg/cm2, pavement thickness=250 mm, poisons ratio=0.15, Modulus of subgrade reaction=12 kg/cm3 ; radius of contact area=0.16 m.	*CO4*	*PO1,4,8*	**10**
			OR			
	5	a)	List the tests conducted on aggregates and Discuss two tests conducted in the laboratory related to toughness and wear and tear of aggregates.	*CO3*	*PO1,4,8*	**10**
		b)	Design a new flexible pavement for a two lane undivided carriageway using the following data: CBR=8%; Initial traffic on completion of construction=1800 cv per day; Average growth rate=6%; Design life=15 years; VDF=2.5. use chart given in Table No.1	*CO4*	*PO1.4,8*	**10**
			UNIT - IV			
	6	a)	Enumerate the steps involved in the construction of Wet Mix Macadam pavement as per MoRT&H specifications.	*CO4*	*PO1,4,8*	**10**
		b)	Discuss the steps involved in the construction of Cement Concrete pavement as per MoRT&H specifications.	*CO4*	*PO1,4,8*	**10**
			UNIT - V			
	7	a)	List the different types of distresses in Rigid pavements with neat sketches.	*CO4*	*PO1*	**6**
		b)	The maximum quantity of water expected in one of the open longitudinal drains on clayey soil is 1.4 m^3/sec. Design the cross section along with longitudinal slope of trapezoidal drain assuming its bottom width as 1 m and cross slope as 1:1.5. The allowable velocity of flow in the drain is 0.8 m/sec and Manning's roughness coefficient is 0.03.	*CO4*	*PO1,4*	**10**
		c)	List the different methods of economic analysis for highway construction and mention their formaulae with usual notations.	*CO1*	*PO1*	**4**

Table No1

CBR, %	CSA, msa	Total pavement thickness, mm	Granular sub-base, mm	Granular base, mm	Dense bituminous Macadam binder course, mm	Bituminous concrete surface course, mm
3	10	760	380	250	90	40
	20	790			120	40
	30	810			140	40
	50	830			160	40
	100	860			180	50
	150	890			210	50
4	10	700	330	250	80	40
	20	730			110	40
	30	750			130	40
	50	780			160	40
	100	800			170	50
	150	820			190	50
6	10	615	260	250	65	40
	20	640			90	40
	30	655			105	40
	50	675			125	40
	100	700			140	50
	150	720			160	50
8	10	550	200	250	60	40
	20	575			85	40
	30	590			100	40
	50	610			120	40
	100	640			140	50
	150	660			160	50
10	10	540	200	250	50	40
	20	565			75	40
	30	580			90	40
	50	600			110	40
	100	630			130	50
	150	650			150	50

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