U.S.N.										

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

Autonomous Institute Affiliated to VTU

July 2023 Semester End Main Examinations

Programme: B.E. **Semester: VI**
Branch: Civil Engineering **Duration: 3 hrs.**
Course Code: 20CV6PEPAD **Max Marks: 100**
Course: Pavement Design **Date: 19.07.2023**

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.
3. Use of IRC-37-2018 is permitted

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)		Define ESWL with a neat sketch.	*CO1*	*PO2*	**6**
	b)		Draw the sketch of flexible pavement cross section. Enumerate the functions of each component.	*CO1*	*PO2*	**8**
	c)		Outline the factors to be considered for design of highway pavements.	*CO1*	*PO2*	**6**
			UNIT - II			
2	a)		The load penetration values of CBR tests conducted on two soil specimens are given below. Determine the average CBR value of soil if 100 divisions of the dial represents 190 kg load in calibration chart of the proving ring.	*CO1*	*PO2*	**10**

Penetration, mm	Load dial readings	
	Specimen 1	Specimen 2
0.0	0	0
0.5	8	0.5
1.0	15	1.5
1.5	23	2.5
2.0	29	6.0
2.5	34	13
3.0	37	20
4.0	43	30
5.0	48	38
7.5	57	50
10.0	63	58
12.5	67	63

	b)		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.	*CO1*	*PO2*	**10**

Mean settlement values, mm	0	0.27	0.51	0.77	1.01	1.27	1.54	1.77
Load values, kg	0	530	1000	1280	1520	1610	1710	1830

			UNIT - III			
	3	a)	Design the pavement for construction of a new flexible pavement with the following data: • Four lane divided carriageway • Initial traffic in the year of completion of construction= 5000CVPD • Percentage of single, tandem and tridem axles are 45, 45 and 10% respectively. • Traffic growth rate per annum is 6% • Design life= 20years • Vehicle damage factor = 5.2 • CBR of soil of subgrade= 7% Design a flexible pavement with untreated granular layer as per IRC: 37-2018.	*CO2*	*PO2*	**10**
		b)	Explain McLeod method of pavement design.	*CO2*	*PO2*	**10**
			OR			
	4	a)	Discuss the vertical stress distribution and surface deflection in a two-layer elastic system?	*CO2*	*PO3*	**10**
		b)	Briefly explain empirical and semi empirical methods of pavement design.	*CO2*	*PO2*	**10**
			UNIT - IV			
	5	a)	Design a rigid pavement making use of Westergaard's wheel load and warping stress equations at edge of the slb. The design data are given below. • Design wheel load, P= 7000kg • Contact pressure P= 7.5 kg/cm^2 • Spacing b/w longitudinal joints = 3.75 m • Spacing b/w contraction joints = 4.2 m • Elastic modulus of CC slab, E= $3*10^5$ kg/cm^2 • Poisson's ratio= 0.15 • Thermal coefficient of CC per °C, e = $1*10^{-5}$ • Flexural strength of CC = 45 kg/cm^2 • K- value of base course = 30 kg/cm^3 • Maximum temperature differential at the location for pavement thickness values of 22,24,26 and 30 cm are respectively 14.8,15.6,16.2 and 16.8°C Desired factor of safety with respect to load stress + warping stress at edge region is 1.1 to 1.2.	*CO2*	*PO2*	**14**
		b)	Define equivalent radius of resisting section and list the types of stresses induced in CC pavement.	*CO2*	*PO2*	**6**
			UNIT - V			
	6	a)	Classify different types of joints in CC pavements and mention the objects of each.	*CO3*	*PO2*	**8**

		b)	Discuss the design features of Steel Fibre Reinforced Concrete	*CO3*	*PO2*	**8**
		c)	Explain the concept of white topping.	*CO3*	*PO2*	**4**
			OR			
	7	a)	The design thickness of CC pavement is 26 cm and lane width of 3.5 m. design the tie bars along the longitudinal joints using the data given below. • Allowable working stress in steel tie bars, S_s=1250kg/cm^2 • Unit weight of CC, W= 2400kg/m^3 • Maximum value of friction coefficient, f= 1.2 • Allowable tensile stress in deformed tie bar, Ss=2000kg/cm^2 • Allowable bond stress in deformed bars, Sb= 24.6 kg/cm^2	*CO3*	*PO2*	**10**
		b)	Summarise the design principle of dowel bars as per IRC-58.	*CO3*	*PO2*	**10**

******