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

Autonomous Institute Affiliated to VTU

September / October 2024 Supplementary Examinations

Programme: B.E. **Semester: VI**
Branch: Civil Engineering **Duration: 3 hrs.**
Course Code: 20CV6PEPAD **Max Marks: 100**
Course: PAVEMENT DESIGN

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 and IRC-58: 2015 is permitted

		UNIT - I	*CO*	*PO*	Marks
1	a)	Elaborate on the functions of different pavement layers. Comment on how pavement layers help to minimize wheel load stresses at the interface between sub-base layer and subgrade soil.	CO1	PO1	10
	b)	Calculate the vertical stress beneath a circular imprint at a depth of 375 mm (or 37.5 cm) for the following conditions. i. Gross load on tyre = 20000 kg ii. Tyre pressure = 0.7 MPa (7 kg/cm^2) Also determine the elastic deformation if the subgrade has a modulus of deformation of 0.5MPa (5.6 kg/cm^2) and the thickness of pavement is 400 mm.	CO1	PO1	10
		UNIT – II			
2	a)	List and explain the traffic parameters required for estimating design traffic volume as per IRC – 37 2018 flexible pavement design guidelines.	CO1	PO1	10
	b)	Determine the total thickness of flexible pavement assuming single layer elastic theory and using the following data:- Design wheel load = 4200 kg; Tyre pressure = 0.6 MPa (6 kg/cm^2); Elastic modulus = 15 MPa (150 kg/cm^2); Permissible deflection = 2.5 mm.	CO2	PO3	10
		UNIT - III			
3	a)	With a neat sketch explain 'Plate load test' to determine the modulus of subgrade reaction of soils.	CO1	PO1	10

		b)	Soil subgrade sample collected from the site was analyzed and the results obtained are as given below: i. Soil portion passing 0.074 mm sieve = 50 percent ii. Liquid limit = 40 percent iii. Plastic Limit = 20 percent Calculate the 'Group Index' for the above data .	**CO1**	**PO1**	**10**
			OR			
	4	a)	Enumerate the steps involved in the design of pavements as per 'AASHTO Guidelines'.	**CO2**	**PO3**	**10**
		b)	Design the pavement for construction of a new bypass with the following data: i. Two lane carriage way ii. Initial traffic in the year of completion of construction = 400 CVPD (sum of both directions) iii. Traffic growth rate = 7.5 % iv. Design life = 15 years v. Vehicle damage factor based on axle load survey = 2.5 standard axle per commercial vehicle vi. Design CBR of subgrade soil = 4%.	**CO2**	**PO3**	**10**
			UNIT – IV			
	5	a)	Explain the steps involved in the design of concrete pavements as per IRC-58: 2015 guidelines.	**CO2**	**PO3**	**10**
		b)	Calculate the stresses at interior, edge and corner regions of a cement concrete pavement using Westergaard's stress equations for the data given below: Wheel load = 4475 kg; Modulus of elasticity of cement concrete = 0.3 $x10^5$ MPa ($3x10^5$ kg/cm^2); Pavement thickness = 170 mm (or 17 cm); Poisson's ratio of concrete = 0.15; Modulus of subgrade reaction = 0.637 MPa (6.5 kg/cm^2); Radius of contact area = 150 mm.	**CO3**	**PO2**	**10**
			UNIT – V			
	6	a)	With a neat plan sketch explain different types of joints in concrete pavements.	**CO2**	**PO2**	**10**
		b)	A cement concrete pavement has a thickness of 18 cm and has two lanes of 7.2 m with a longitudinal joint along the center. Design the dimensions and spacing of the tie bar for the following data: - Allowable working stress in tension, S_S = 137.4 MPa (1400 kg/cm^2); Unit weight of concrete, W = 24kN/m^3 (or 2400 kg/m^3); Coeff. of friction f = 1.5;	**CO2**	**PO3**	**10**
			OR			
	7	a)	Write short notes on i. White topping ii. CRCP	**CO1**	**PO1**	**10**
		b)	Determine the spacing between contraction joints for 3.5m wide slab having thickness of 20 cm and coefficient of friction 1.5 for the following two cases: - i. For plain cement concrete, allowable stress S_c = 0.08 MPa (0.8 kg/cm^2) ii. For reinforcement cement concrete, 10 mm diameter bars at 0.3 m spacing.	**CO2**	**PO3**	**10**

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