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

Autonomous Institute Affiliated to VTU

June 2025 Semester End Main Examinations

Programme: B.E. **Semester: VI**

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

Course Code: 23CV6PCBFS **Max Marks: 100**

Course: Bridge Engineering and Foundation Systems

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-6, IRC-21, IS: 456-2000, IS 2911, Piguard's curves 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 Bridge. Briefly explain the components of a bridge with a neat sketch.	*CO1*	*PO1*	**10**
	b)	A T – beam and slab bridge needs to be provided across a river having the following data: **Distance (meters)**: 0, 11.28, 24.4, 52.4, 68.3, 80.5, 85.3 **R.L (meters)**: 10.97, 9.75, 4.27, 2.44, 5.49, 10.36, 10.67 HFL = 9.15 m, Manning's co-efficient N = 0.03, Maximum allowable velocity under the bridge = 1.2 times natural velocity, slope of river bed 1/1650. Calculate the span of the bridge.	*CO1*	*PO2*	**10**
		OR			
2	a)	Outline and explain the factors which govern the selection of an ideal site of a railway bridge over an alluvial river.	*CO1*	*PO1*	**10**
	b)	The following data refers to a bridge site at which it is proposed to construct an R.C. slab bridge. Flood discharge = 30 cumecs Side slopes of valley = 1:1 Bed fall at site 1 in 2500 Ratio of bed width to depth = 8:1 Maximum afflux allowed = 75 mm Bed material is gravel with roughness coefficient = 0.025 Safe velocity for no scour = 2.5 m/sec Design a suitable waterway.	*CO1*	*PO2*	**10**

			UNIT - II			
	3		Obtain Courbon's reaction factor and the maximum bending moment in case of a T-beam bridge having following details: Roadways: 2 lanes Loading: IRC Class A No. of main girders: 3, c/c spacing = 2.6 m Span of bridge = 16 m Kerb width: 600 mm on either side	*CO1*	*PO3*	**20**
			OR			
	4		Design an intermediate panel of deck slab of a RCC T-beam - slab type bridge for a National highway to suit the following data using Pigeaud's Curve: Effective span of T-beam = 14.0m Clear width of roadway = 7.5m; Kerbs: 600mm wide x 300mm (depth) either side. Thickness of plain cement concrete wearing coat = 100 mm. Three longitudinal girders at 3 m c/c Cross girders at 3.5 m c/c. Width of longitudinal and cross girders = 300 mm Use M30 grade concrete and Fe 415 grade steel.	*CO1*	*PO3*	**20**
			UNIT - III			
	5	a)	Describe briefly the following with a neat sketch: a) Rocker and Roller Bearing b) Elastomeric Bearing	*CO1*	*PO1*	**10**
		b)	Design a reinforced concrete rocker bearing to transmit a support reaction of 600 kN. Adopt M30 grade concrete & Fe 415 grade HYSD steel bars. Permissible bearing stress is 8 N/mm^2	*CO1*	*PO3*	**10**
			OR			
	6	a)	Describe the different types of bridge pier with a neat sketch.	*CO1*	*PO1*	**10**
		b)	Design a mild steel rocker bearing for transmitting the superstructure reactive load of 1200 kN. Allowable pressure on bearing block = 3.8 MPa Permissible bending stress: 0.66 f_y = 165 MPa Permissible bearing stress = 100 MPa Permissible shear stress = 100 MPa	*CO1*	*PO3*	**10**
			UNIT - IV			
	7	a)	Find the uplift capacity of the pile	*CO2*	*PO2*	**10**

			Given: dia=0.4m, Length=20m, $\gamma sat=19.5kN/m^3$, $\gamma b=18kN/m^3$, $\gamma w=10kN/m^3$, $\gamma concrete=24kN/m^3$, $\phi=38^0$, Critical Depth=14.5B, K=2.3, $\delta=\phi$, water table is 2m from the ground surface			
		b)	A RCC pile is proposed in a clay soil with a UCC strength of $120kN/m^2$ and $\gamma = 18kN/m^3$. If the diameter of the pile is 40cm. Find the length of the pile required to carry a load of 600kN.	*CO2*	*PO2*	**10**
			OR			
	8	a)	A 10m long concrete pile 30cm diameter is driven into a dense sand having $\phi = 30$ degree, $\gamma = 18kN/m^3$, K=1.5, $\phi = \delta$. Find the safe load if Dc=10B, Nq=22.5 and $N\gamma$=19.7	*CO2*	*PO2*	**10**
		b)	A square pile group of 165 piles penetrates through a filled-up soil of 3m depth. The pile diameter is 250mm and pile spacing is 0.75m. The unit cohesion of the material is $18kN/m^2$ and the unit weight of the soil is $15kN/m^3$. Compute the negative skin friction on the group.	*CO2*	*PO2*	**10**
			UNIT - V			
	9	a)	Explain the rectifying methods for shifting and tilting problems	*CO2*	*PO1*	**12**
		b)	Explain the parts of a well foundation with a neat sketch	*CO2*	*PO1*	**8**
			OR			
	10	a)	Explain the different shapes that can be casted for a well foundation.	*CO2*	*PO1*	**5**
		b)	Explain the process of sinking of wells	*CO2*	*PO1*	**10**
		c)	Explain the advantages of a well foundation	*CO2*	*PO1*	**5**

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