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

Autonomous Institute Affiliated to VTU

January / February 2025 Semester End Main Examinations

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

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

Course Code: 20CV5PCDRC **Max Marks: 100**

Course: Design of RCC Structural Elements and CAD Lab

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 IS 456:2000 and Charts of SP-16 only 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)	A singly reinforced concrete beam of 300 mm x 500 mm effective depth reinforced with 4 bars of 20 mm diameter. If the beam is simply supported with a effective span of the beam is 6 m calculate the maximum permissible moment of resistance that the beam can carry safely. Take M25 grade of concrete and Fe-500 grade of steel.	*CO 1*	*PO 2, PO 3*	**10**
	b)	A T-beam of effective flange width of 1200 mm, thickness of 120 mm with width of rid 250 mm and effective depth 500 mm is reinforced with 4 bars of 25 mm diameter on tension side. Calculate the moment of resistance of the beam. Use M20 grade concrete and FE 415 steel.	*CO 1*	*PO 2, PO 3*	**10**
		OR			
2	a)	From the first principles, derive the stress block parameters and hence the expression for the moment of resistance.	*CO 1*	*PO 2, PO 3*	**10**
	b)	A rectangular beam of 300 mm x 600 mm effective depth is reinforced with 3 bars of 16 mm on compression side and 4 bars of 20 mm on tension side. The cover to the reinforcement on compressive side is 50 mm. Determine the ultimate moment of resistance. Take M20 grade concrete and Fe 500 grade steel.	*CO 1*	*PO 2, PO 3*	**10**
		UNIT - II			
3		Design a beam of rectangular cross section 300 mm x 450 mm effective depth is subjected to a factored bending moment of 150 kN-m, factored torsional moment of 60 kN-m and ultimate shear force of 100 kN. Use M 20 grade concrete and Fe 415 grade steel.	*CO 2*	*PO 2, PO 3*	**20**

			OR			
	4	a)	Design the tension reinforcement for a T-beam section used for a simply supported beam of span 6 m with the spacing between the beams 3.5 m c/c. The superimposed load = 4 kN/m^2, floor finish = 1 kN/m^2, slab thickness = 150 mm. Assume width of web as 230 mm and total depth as 600 mm. Assume cover to the reinforcement as 50 mm. Use M20 concrete and Fe 415 steel.	*CO 2*	*PO 2, PO 3*	**10**
		b)	A simply supported beam 300 mm x 550 mm effective depth carries a uniformly distributed load 70 kN/m including its self-weight over a span of 7 m. The tension reinforcement consists of 5 bars of 20 mm diameter and out of these, 2 bars are bent up at 1 m from the support. Design the shear reinforcement for the beam. Use M20 concrete and Fe 415 steel.	*CO 2*	*PO 2, PO 3*	**10**
			UNIT - III			
	5		Design a RCC slab for a room of clear dimensions 4.5 m x 6 m. The slab is discontinuous on one longer edge. The superimposed load acting on slab is 5 kN/ m^2 along with floor finishes is 1 kN/m^2. Sketch the reinforcement details. Use M20 concrete and Fe 415 steel.	*CO 2*	*PO 2, PO 3*	**20**
			OR			
	6	a)	Differentiate between short term and long-term deflections.	*CO 1*	*PO 1, PO 2*	**05**
		b)	A rectangular simply supported beam of size 250 mm x 550 mm overall depth having effective span 6 m is reinforced with 5 bars of 20 mm diameter on tension side with an effective cover of 50 mm. If the beam is subjected to an imposed load of 35 kN/m, calculate the short-term deflection. Assume M20 concrete and Fe-415 steel.	*CO 1*	*PO 2, PO 3*	**15**
			UNIT - IV			
	7	a)	A Column of 300 x 300 mm has an effective length of 4 m and is reinforced with 4 bars of 25 mm diameter at clear cover of 40 mm. Determine the safe axial load that the column can carry. Assume M20 grade of concrete and Fe 415 grade of steel.	*CO 2*	*PO 2, PO 3*	**10**
		b)	Design a short column to carry a working load of 1200 kN and uniaxial moment of 200 kN-m about the axis bisecting the depth. Use M20 concrete and FE 415 steel.	*CO 2*	*PO 2, PO 3*	**10**
			OR			
	8	a)	Discuss the importance of minimum eccentricity in design of columns.	*CO 1*	*PO 1, PO 2*	**05**

		b)	A corner column of 300 x 300 mm is subjected to factored loads of Pu = 1600 kN, Mux = 160 kN-m and Muy = 120 kN-m. The unsupported length of the column is 3 m. Design the reinforcement for the column assuming M25 concrete and Fe 415 steel.	*CO 2*	*PO 2,* *PO 3*	**15**
			UNIT - V			
	9		Design an isolated footing of uniform thickness for RC Column of dimension 300 x 450 mm carries a vertical load of 600 kN. The safe bearing capacity of the soil is 130 kN/m^2. Use M20 concrete and Fe 415 steel. Sketch the reinforcement details.	*CO 2*	*PO 2,* *PO 3*	**20**
			OR			
	10		Design a dog-legged stair for a building in which the vertical distance between the floors if 4 m. The staircase hall measures 4 m x 6 m. The live load may be taken as 2.5 kN/m^2. Use M20 concrete and Fe 415 steel.	*CO 2*	*PO 2,* *PO 3*	**20**

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