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

Autonomous Institute Affiliated to VTU

September / October 2023 Supplementary 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 IS456-2000 is permitted
4. Use of charts 43, 44, 45, 46, 63, 64 and 65 of SP-16 is permitted

UNIT - I

1	a)	Compare the relative merits of limit state design over working stress method of design.	**04**
	b)	A rectangular beam of overall size 250 mm x 450 mm is reinforced with 4 bars of 20 mm diameter on tension side and 3 bars of 16 mm diameter in the compression zone. Find the permissible live load the beam can carry over a simply supported span of 6m. Assume M20 concrete and Fe 415 steel. Assume the condition of exposure as mild.	**06**
	c)	An RCC T-beam has an effective depth of 750 mm, effective flange width of 1500 mm, flange thickness of 150 mm and width of web is 300 mm. Assuming the given section as the minimum concrete section, estimate the safe udl the beam can carry over a simply supported span of 8 m.	**10**

OR

2	a)	Explain the significance of bond in RC members and list the factors influencing bond resistance.	**04**
	b)	Calculate the development length for a bar of 20 mm diameter to carry 50 % of its full design strength. Assume the bar is of grade Fe 550 and concrete is M20.	**04**
	c)	An RCC T-beam has an effective depth of 650 mm, effective flange width of 1500 mm, flange thickness of 150 mm and width of web is 300 mm. The beam is to carry a factored moment of 750 kNm. Determine the area of tension reinforcement. M20 concrete and Fe500 grade steel are available for use.	**12**

UNIT - II

3	a)	An RC beam of overall size 230 mm x 450 mm is subjected to a factored bending moment of 180 kNm, ultimate shear of 100 kN and ultimate torsional moment of 60 kNm. Design suitable reinforcement for the beam. Assume M20 concrete and Fe 500 grade steel. Sketch reinforcement details.	**12**

b) An RCC beam has an effective depth of 500 mm and breadth of 300 mm. It contains 4 bars of 25 mm diameter bars out of which 2 bars are bent up at 45^0 near supports at a distance of L/7 from the face of support, where 'L' is the effective simply supported span. If f_{ck} = 20 MPa and f_y =415 MPa, design suitable shear reinforcements for a factored shear force of 600KN. **08**

UNIT - III

4 Design a two way RCC slab for a room of clear dimensions 4 m x 6m. The slab is discontinuous on one long edge. Concrete of M20 grade and Fe 415 HYSD bars are available for use. Live load on slab is 4.25 kN/ m^2 and load due to floor finishes is 0.75 kN/$m^{2.}$ Sketch the reinforcement details in the slab. **20**

OR

5 a) Explain the significance of evaluation of short term deflection in RC members. **06**

b) A cantilever beam of span 3.5 m is rectangular of size 350 mmx 600 mm (overall). The beam carries a live load of 30 kN/m. The permanent load may be assumed as self-weight plus 40 % of live load. The beam is reinforced with 5 of 25 mm diameter in tension side. Estimate the short term, long term and total deflection. Comment on your results from the view point of service limit state requirement as per IS 456-2000. **14**

UNIT - IV

6 a) Explain briefly the significance of providing lateral ties in RCC columns. Sketch any two ways of arrangement of lateral ties in RC columns. **05**

b) A corner column (400 mm x 400 mm), located in the lowermost storey of a system of braced frames, is subjected to factored loads Pu = 1300kN and Mux = 190 kN-m and Muy = 110 kN-m. The unsupported length of the column is 3.5 m. Design the reinforcement in the column. Assuming M25 concrete and Fe415 steel **15**

UNIT - V

7 Design an isolated footing for a rectangular RCC Column 300mm x 450 mm in size, supporting a service load of 1500 kN. Assume the safe bearing capacity of the soil as 160 kN/ m^2. Use M 20 concrete and Fe 415 steel. Sketch reinforcement details. **20**

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