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15CV/CT51

Fifth Semester B.E. Degree Examination, June/Jul 2018
Design of RC Structural Elements

Time: 3 hrs. Max. Marks: 80

Note: 1. Answer FIVE full questions, choosing one full question from each module.
2. Use of IS456-2000, SP16 permitted.

Module-1

1 a. Differentiate between working stress method and limit state method of RCC design. **(05 Marks)**

b. Define:
i) Partial safety factor for load and materials.
ii) Characteristic load.
iii) Characteristic strength. **(03 Marks)**

c. A simply supported beam of rectangular section spanning over 6m has a width of 300mm and overall depth 600mm. The beam is reinforced with 4-25mm bars on tension side. The beam is subjected to moment of 160kNm. Check the beam for serviceability limit state of cracking. Assume M25 and Fe415. **(08 Marks)**

OR

2 a. Derive the expression for stress block parameter for compresive force C_u, tensile force T_u and locate the depth of neutral axis $y = 0.42\ x_u$ from top of the beam. **(05 Marks)**

b. Explain briefly under reinforced, over reinforced and balanced sections with sketch. **(03 Marks)**

c. A simply supported beam of rectangular section 250mm wide by 450mm overall depth is used over an effective span of 4m. the beam is reinforced with 3 bars of 20mm. Two hanger bars of 10mm diameter are provided. The self weight of the beam is 4kN/m and service load is 10kN/m. Assume M20, Fe415.
Compute: i) Short term deflection; ii) Long term deflection. **(08 Marks)**

Module-2

3 a. Define simply and doubly reinforced beams list the situations when they are adopted. **(05 Marks)**

b. Determine moment of resistance of T-beam for the following data:
Width of the flange = 2500mm, effective depth = 800mm, width of the web = 300mm, number of bars = 8 of 25mm diameter, depth of flange = 150mm. Assume M20 and Fe415 steel. **(11 Marks)**

OR

4 a. A simply reinforced concrete beam 250 × 450mm deep upto the centre of reinforcement is reinforced with 3-16mm bars with an effective cover of 50mm. The effective span of the beam is 6m. Determine the central point load that the beam can carry excluding self weight. Assume M20 and Fe415. **(08 Marks)**

b. A doubly reinforced beam is 250mm wide and 450mm deep to the centre of tensile reinforcement. It is reinforced with 2-16 compression reinforcement and 4-25 as tensile reinforcement. Calculate the ultimate moment of resistance of the beam. Assume M15 and Fe250 steel. **(08 Marks)**

Module-3

5 a. Design a reinforced concrete beam of rectangular section using the following data: Effective span = 5m, width of the beam = 250mm, overall depth = 500mm, D.L + L.L. = 40 kN/m, effective cover = 50mm. **(07 Marks)**

b. A T beam slab floor of an office comprises of a slab 150mm thick resting on beams 3m c/c. The effective span of beam is 8m. Assume live load on the floor as 4kN/m^2. Use M20 and Fe415. Design one of the intermediate T beams. **(09 Marks)**

OR

6 a. A reinforced concrete beam over an effective span 5m carries a load of 8kN/m inclusive of self weight. Assume M20 and Fe415. Design the beam to satisfy the collapse and serviceability limit states. **(08 Marks)**

b. A cantilever beam of 4m span carries a load of 40kN/m. The width of the beam is 230mm. Design the beam for flexure and shear. Sketch the details of reinforcement. Assume M20 and Fe415. **(08 Marks)**

Module-4

7 a. Distinguish between one way slab and two way slab. **(04 Marks)**

b. Explain the importance of bond, anchorage length. **(04 Marks)**

c. Design a two way slab for an office floor of 3.5 × 4.5m simply supported on all sides with corners prevented from lifting. Take live load of 4kN/m^2. Assume M20 and Fe415. **(08 Marks)**

OR

8 a. What is development length? Write the expression for development length. **(04 Marks)**

b. Design one of the flights of dog logged stair case spanning between landing beams using the following data:

Number of steps in the flight	= 10
Tread	= 300mm
Rise	= 150mm
Width of landing beams	= 300mm

Assume M20 and Fe415. **(12 Marks)**

Module-5

9 a. What is the role of transverse reinforcement in columns? What are the codal provisions to design the transverse reinforcement? **(05 Marks)**

b. Design the reinforcement for a column of size 300 × 500mm to support a factored load of 500kN and a factored moment of 200 kNm. Assume M20 and Fe415. Sketch the reinforcement details. **(11 Marks)**

OR

10 a. Explain the different between short columns and long columns. Why is reduction coefficient applied to long column? **(04 Marks)**

b. Design a isolated forting for a rectangular column of 300mm × 500mm supporting an axial load of 1500kN factored. Assume SBC of soil as 185 kN/m^2. Use M20 and Fe415. Sketch the reinforcement and perform the necessary checks. **(12 Marks)**

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