



P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Fifth Semester, B.E. - Civil Engineering

Semester End Examination; Dec - 2017/Jan - 2018

Design of RC Structural Elements

Time: 3 hrs

Max. Marks: 100

Note: i) Answer **FIVE** full questions, selecting **ONE** full question from each unit

ii) Missing data, if any, may be suitably assumed

iii) Use of IS- 456 and SP -16 is permitted.

UNIT - I

- 1 a. Derive the expression for depth of NA $\bar{y} = 0.42 xu$, in the case of rectangular RCC beam design. 6
- b. Distinguish between Balanced, under reinforced and over reinforced section of RCC beam design. 6
- c. A rectangular RC beam 230 x 450 is reinforced with 3-16 mm dia bars on tension side with an effective cover of 40 mm. If M20 concrete and mild steel used. Calculate the moment of resistance of the beam. 8
- 2 a. Explain the following;
- i) Characteristic loads ii) Partial safety for loads 8
- iii) Characteristics strength iv) Partial safety of materials.
- b. Explain the assumptions made in limit state method? 4
- c. Determine the moment of resistance of 'T' section having the following section properties, $b_f = 2500$ mm, $D_f = 150$ mm, $b_w = 300$ mm, $d = 800$ mm. $A_{st} = 8\#25$ mm materials M20 and Fe 415 HYSD bars. 8

UNIT - II

- 3 a. What is development length? Obtain an expression for development length. 6
- b. Define deflection and distinguish between long term and short term deflection in RC members. 6
- c. A doubly reinforced concrete beam having a rectangular section 250 mm wide and 540 mm overall depth is reinforced with 2 bars of 12 mm in compression side and 4#20 mm in tension side. The effective cover is 40 mm. Use M20 and Fe 415. Estimate the flextural strength of beam using IS 456-2000. 8
- 4 a. Explain briefly shear failures in RC members? 8

- b. Design the necessary reinforcement for an RC beam 250 x 500 mm subjected to BM of 120 kN-m. Shear force of 20 kN and torsional moment of 10 kN-m. Use M20 and Fe 415. 12

UNIT - III

5. Design a cantilever beam of effective span 3m subjected to UDL 10 kN/m and point load of 25 kN at free end. Use M20 and Fe 415. Take beam width 250 mm. Sketch the reinforcement. 20
6. Design a RCC beam of section 230 x 600 mm effective span of beam is 6 m effective cover is 50 mm. Live load 75kN/m use M20 and Fe 415. Sketch the details of reinforcement. 20

UNIT - IV

7. Design a slab over a room of 4m x 5 m supported on 230 mm thick brick wall. All the four edges are discontinuous. Use the load of 3 kN/m², floor finish 1 kN/m², M20 and Fe 415. 20
- 8 a. List and explain briefly different types of stairs. 5
- b. Design an open well stair case for a public building. The staircase room has clear dimensions of 6 m x 4.5 m. The height between the floors is 4.5 m. The stairs are supported at the outer edges of the landing, parallel to the rises. Use M25 and Fe 500. Sketch the details, take wall thickness 230 mm. 15

UNIT - V

- 9 a. Difference between long column and short column. 4
- b. Design a short square column subjected to an axial load of 2000 kN. Use Fe 415 and M20. 8
- c. Design a circular column of diameter 400 mm subjected to 800 kN load and 20 kN-m moment. Use M20 and Fe 415. 8
10. Design a reinforced concrete footing for a rectangular column of section 300 mm by 500 mm supporting an axial factored load of 1500 kN. The safe bearing capacity of the soil at site is 185 kN/m². Adopt M20 and Fe 415 HYSD bars. 20

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