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

(An Autonomous Institution affiliated to VTU, Belagavi)

Second Semester, M. Tech - Civil Engineering (MCAD)

Semester End Examination; May/June - 2019

Structural Design - RCC Structures

Time: 3 hrs

Max. Marks: 100

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

ii) Use of IS 456-2000 and SP16 are permitted. iii) Missing data, if any, may be suitably assumed.

UNIT - I

1. Design a rectangular continuous beam which consists of three spans of 7.5 m each. The characteristic dead load is 18 kN/m and the characteristic live load is 15 kN/m. Use M₂₀ concrete and Fe415 steel. Sketch the reinforcement details. 20
2. Two span continuous beam of effective span 6 m is simply supported at supports. The beam is to be designed to carry a dead load of 16 kN/m (inclusive of self weight) and a maximum live load of 24 kN/m. Allowing 15% distribution design to beam of cross section 230 mm × 500 mm. Use M₂₀ concrete and Fe415 steel. Sketch the reinforcement details. 20

UNIT - II

3. Design an interior panel of a flat slab of size 5 m × 5 m without providing drop and column head. Size of columns is 500 × 500 mm and live load on the panel is 4 kN/m². Take floor finishing load as 1 kN/m². Use M₂₀ concrete and Fe415 steel. Sketch details of reinforcement. 20
4. Design an interior panel of a flat slab with panel size 6 m × 6 m supported by columns of size 500 mm × 500 mm. Provide suitable drop, take live load as 4 kN/m². Use M₂₀ concrete and Fe415 steel. Sketch reinforcement details. 20

UNIT - III

5. Design a RCC portal frame (beam and columns only) having an effective span of 8 m and on effective height of 4 m. The portal frames are spaced at 4 m intervals. Take live load as 1.5 kN/m², SBC of soil = 150 kN/m². The base of the columns may be assumed as fixed. Use M₂₀ concrete and Fe415 steel. Sketch reinforcement details. 20
6. The roof of an 8 m wide hall is supported on portal frame spaced at 4 m intervals. The height of the portal frame is 4 m. The continuous slab is 120 mm thick. Live load on roof is 1.5 kN/m². SBC of soil is 150 kN/m². The column may be assumed as fixed. Design the column and beam members of the portal frame. Use M₂₀ concrete and Fe415 steel. Sketch details of reinforcement. 20

UNIT - IV

7. Design the side walls and hopper bottom of rectangular bunker of capacity 300 kN to store coal. Use M₂₀ concrete and Fe415 steel. Take unit weight of coal as 8 kN/m³ and angle of repose = 25. Sketch reinforcement details. 20

8. A cylindrical silo having an internal diameter 5.5 m, height of cylindrical portion 18 m and central opening with 0.5 m is to be built to store wheat. Design the silo using M₂₀ concrete and Fe415 steel. Given,

Unit weight of wheat = 8.5 kN/m³

Angle of internal friction = 28°

Angle of wall friction = 0.75φ while filling

Angle of internal friction = 0.60φ while emptying

Pressure ratio = $\frac{P_h}{P_r} = k = 0.5$ while filling

Use Janssen's theory of pressure calculations. Sketch reinforcement details.

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UNIT - V

9. A 250 mm thick reinforced concrete vertical wall of height 3.6 m is supported over 500 mm wide piers having clear spacing of 5.1 m. The wall carries service superimposed load 190 kN/m. Design the panel as a deep beam considering it to be simply supported beam. Use M₂₀ concrete and Fe415 steel. Sketch reinforcement details.
10. A 230 mm thick reinforced concrete vertical wall of height 3.8 m is supported over 550 mm wide piers having clear spacing of 5.1 m. The wall carries service superimposed load of 210 kN/m. Design the panel as a deep beam considering it to be continuous over several supports. Use M₂₀ concrete and Fe415 steel. Sketch reinforcement details.

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