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Fifth Semester B.E. Degree Examination, Dec.2016/Jan.2017
Design of RCC Structural Elements

Time: 3 hrs.

Max. Marks:100

**Note: 1. Answer FIVE full questions, selecting
at least TWO questions from each part.
2. Use of IS456-2000 and SP16 is permitted.**

PART – A

- 1 a. What are the different loads to be considered in the design of an reinforced concrete element? (06 Marks)
- b. Explain the philosophy and principles of limit state method of design. (10 Marks)
- c. Explain the necessity of adopting partial safety factors for loads and material strength. (04 Marks)

- 2 a. A single reinforced concrete beam 250×450 mm deep upto the centre of reinforcement is reinforced with 3-16 mm dia at an effective cover 50 mm, effective span 6 m, M20 concrete and Fe415 steel. Determine the central point load that can be supported in addition to the self weight. (10 Marks)
- b. Determine the moment of resistance of a T-beam for the following data:
Breadth of the flange = 740 mm; Effective depth = 400 mm; Breadth of the web = 240 mm;
Area of steel = 5 – 20; Depth of flange = 110 mm; Adopt M20 grade concrete and Fe415 grade steel. (10 Marks)

- 3 a. What are the factors affecting the short term and long term deflections? (06 Marks)
- b. A singly reinforced rectangular beam 360mm×580mm in section is simply supported on a effective span of 5.25 m. The steel reinforcement consists of 6#20 ϕ . The beam supports a udl of 25 kN/m (Dead load) and 28 kN/m (live load). Assume M₂₀ concrete and Fe415 steel. Check the design for short and long term deflection. Take ultimate strain in concrete due to shrinkage as 0.0003 and co-efficient of creep as unity. Effective cover may be taken as 40 mm. (14 Marks)

- 4 A Tee beam slab floor of an office comprises a slab 150 mm thick spanning between ribs of 250 mm wide spaced at 3.2 m centre to centre. Clear span of beam = 7.70 m. The beam is 600 mm deep including slab and simply supported over walls of 300 mm wide. Live load on floor = 4 kN/m², Floor and ceiling finish = 0.75 kN/m². The beam also support a partition wall which transmits a load of 12 kN/m. Design one of the intermediate beam for flexure and shear. Also check for beam for deflection control. Assume effective cover = 50 mm. M20 grade and Fe415 steel. (20 Marks)

PART – B

- 5 a. Distinguish between one way and two way slab. (04 Marks)
- b. Design a two way slab for a room of internal dimensions 4m×5m, supported on walls of 300 mm thickness with one corner held down. Two adjacent edges of the slab are discontinuous. Thickness of slab = 150 mm. The slab is to support a live load of 3 kN/m² and floor finish of 1 kN/m². Sketch the reinforcement details M20, Fe415 grade. (16 Marks)

- 6 a. Design a column 4 m long restrained in position and direction at both ends to carry an axial load of 1600 kN. Use M-20 grade concrete and Fe-415 grade steel. Sketch the reinforcement details. (10 Marks)
- b. Design a R.C. column, 400 mm square, to carry an ultimate load of 1000 kN and ultimate moment of 160 kN-m. Use M20 concrete and Fe415 steel. Provide a cover of 40 mm. (10 Marks)
- 7 Design an isolated footing of uniform thickness for an RC square column, of size 500mm × 500mm bearing a vertical load of 600 kN. The safe bearing capacity of the soil may be taken as 120 kN/m². Use M-20 grade concrete and Fe-415 grade steel. Sketch the reinforcement details. (20 Marks)
- 8 Design a dog legged stair for an office building in a room measuring 2.8m × 5.8m. Clear vertical distance between the floor is 3.6 m. The width of flight is to be 1.25 m. Assume imposed load of 3 kN/m². Use M20 concrete and Fe415 grade steel. Assume that the stairs are supported on 230 mm at the outer edges of landing slabs. Sketch the reinforcement details. (20 Marks)

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