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Fifth Semester B.E. Degree Examination, Dec.2017/Jan.2018
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. *IS: 456 -2000 and SP – 16 is permitted.*

PART – A

1   Explain the following :
  a. Partial safety factors for loads and materials.   **(04 Marks)**
  b. Explain the principles of limit state design.   **(06 Marks)**
  c. Show that x_u limt = 0.53d, for Fe250 grade of steel.   **(04 Marks)**
  d. Explain under reinforces section, over-reinforced section, balance section with a neat sketches.   **(06 Marks)**

2   A R.C.C beam of rectangular section 300×600mm is reinforced with 4 bars of 20mm dia with an effective cover 50mm, effective span of the beam is 6m. Assuming M20 concrete and Fe250 steel. Determine the central concentrated P, that can be carried by the beam in addition to its self weight.   **(20 Marks)**

3   a. Distinguish between short term and long term deflection in case of R.C structures. Mention the main factors affecting these deflections.   **(06 Marks)**
  b. A rectangular simply supported beam of span 5m is 300mm×650mm in cross section and is reinforced with 3 bars of 20mm on tension side at an effective cover of 50mm. Determine the shaft term defection due to an imposed working load of 20kN/m (excluding self wt). Assume grade of concrete M20 and grade of steel Fe415.   **(14 Marks)**

4   A T-Beam slab floor has 125mm thick slab forming part of T – beam which are of 8m clear span. The end bearing are 450mm thick. Spacing of T-beams is 3.5m. The live load on the floor is 3kN/m². Design one of the intermediate beams. Use M20 concrete and Fe415 steel.   **(20 Marks)**

PART – B

5   Design a slab for a room of clear dimensions 3m×5m supported on wall of 300mm thickness with corners held down. Two adjacent sides of the slab are continuous and other discontinuous. LL on slab is 3kN/m². Assume floor finish of 1kN/m². Use M20 concrete and Fe415 steel. Sketch the details of reinforcement.   **(20 Marks)**

6   a.   Design the reinforcement for a axially loaded square column of size 450mm × 450mm to support a load of 1500 kN. Use M20 concrete and Fe415 steel.   **(10 Marks)**

   b.   A column size of 300×400mm has effective length of 3.6m and is subjected to $P_u = 1100kN$, and $M_u = 150$ kN-m, about the major axies. Assume the bars on two side, design the column using M25 concrete and Fe415 steel.   **(10 Marks)**

7   Design on Isolated rectangular Footing of uniform depth for the column size of 230mm×300mm supporting an axial service load of 850kN. The safe bearing capacity of soil is 150kN/m^2. Adopt M20 grade concrete and Fe415 grade steel. Sketch the reinforcement details.   **(20 Marks)**

8   Design a dog-legged stairs for an building in a room measuring 3.6×5.2m clear. The vertical distance between the Floors is 3.2m. Consider LL 3kN/m^2. Use M20 concrete and Fe415 grade of steel. Assume stairs are supported on 300mm wall at the outer edges of landing slabs. Consider Rise = 160mm, and Tread = 300mm.   **(20 Marks)**

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