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10CV52

Fifth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Design of RCC Structural Elements

Time: 3 hrs.

Max. Marks:100

- Note:** 1. Answer any FIVE full questions, selecting atleast TWO questions from each part.
 2. Use of code IS-456-2000 and SP16 is permitted.
 3. Assume missing data, if any, suitably.

PART - A

- 1 a. Explain with the help of classical reliability model the following :
 - (i) Characteristic Load and Design Load
 - (ii) Characteristic Strength and Design strength of concrete and steel. (06 Marks)
- b. Distinguish between underreinforced section and overreinforced section with neat sketches. (06 Marks)
- c. Derive an expression for maximum depth of neutral axis and limiting percentage of steel for rectangular R.S. Section for M20 concrete and Fe415 grade steel. (08 Marks)
- 2 a. Determine the moment of resistance of a singly reinforced R.C. beam of size 250mm × 500mm overall. The beam consists of 3 – # 18 in the tension zone. Also calculate the superimposed live load the beam can carry over a simply supported span of 6m. Use M-20 concrete and Fe415 steel. Assume moderate exposure. (10 Marks)
- b. An R.C. beam of size 250×500mm overall is reinforced with 5 – # 25mm bars in tension and 5 – # 12mm bars in compression with a clear cover of 25mm. Effective span of the beam is 4m. Determine the ultimate moment of resistance of the section. (10 Marks)
- 3 a. What are the major factors that influence crack width in R.C. beams? (04 Marks)
- b. What is development length? Calculate development length in tensions for M-20 grade concrete and Fe415 grade steel. (04 Marks)
- c. A T beam slab floor consists of 150mm thick slab (R.C. slab) monolithic with 300mm wide beams. The beams are spaced at 3.5m c/c. The effective span of the beam is 6m. The superimposed load on the slab is 05 kN/m². Calculate the area of flexural steel required. (12 Marks)
- 4 Design a cantilever beam for flexure and shear, if its effective span is 3m. The beam is subjected to an udl of 15 kN/m along with 20 kN at free end. Check for deflection. Materials used are M25 and Fe415 grade concrete and steel respectively. Assume Moderate Exposure condition. (20 Marks)

PART - B

- 5 Design a slab over a room of internal dimension 4m × 5.5m supported on 230mm thick brick wall. Consider Live Load = 2kN/m² and floor finish = 1 kN/m². The corners are free to be lifted up. Use M20 grade concrete and Fe415 grade steel. (20 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
 2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.



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- 6 a. Design a circular column to carry an axial load of 2000 kN. Use M25 grade concrete and Fe500 grade steel. (08 Marks)
- b. Design a short rectangular column subjected to an axial load of 3000 kN. Take effective length = 3.0m. M20 Concrete and Fe415 steel are used. Check for minimum eccentricity. (12 Marks)
- 7 A rectangular column of size 350mm × 550mm carries a live load of 1800 kN. The safe bearing capacity of soil is 200 kN/m². Design a rectangular footing to support the column. Sketch the details of reinforcement. M25 concrete and Fe415 steel are used. (20 Marks)
- 8 Design a second flight of a doglegged staircase given the following details:
Height between floors = 3.6m, Rise = 150 mm, Tread = 250mm, Imposed Load = 3 kN/m².
Dimension of staircase = 2.4m × 5.5 m. Assume stairs are to be supported on landing beams of width 250mm parallel to stairs. Use M-20 concrete and Fe415 steel. Sketch the details of reinforcement. (20 Marks)
