Fifth Semester B.E. Degree Examination, June/July 2017
Design of RC 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 IS – 456 – 2000 and SP – 16 is permitted.*

PART – A

1 a. Explain the philosophy and principles of limit state method of RCC design. **(06 Marks)**
   b. Explain the following :
      i)   Characteristic loads
      ii) Characteristics strength
      iii) Partial safety factor for loads
      iv) Partial safety factor for materials. **(08 Marks)**
   c. Explain different types of steel used in RCC. **(06 Marks)**

2 a. What is a stress block? Derive from fundamentals the expression for area of stress block $0.36 t_{ck} x_u$ and depth of centre of compressive force from the extreme fibre in compression $0.42 x_u$. **(08 Marks)**
   b. A RC beam 200mm wide by 500mm deep effective is reinforced with 3 nos of 16mm dia bars. Find the moment of resistance of the beam. Effective span is 5.0m. If the effective cover is 40mm, find the safe working load as well as superimposed load. Use M25 grade concrete and Fe 415 steel. **(12 Marks)**

3 a. Explain the importance of side face reinforcement. Give the specification for the same. **(06 Marks)**
   b. Enlist various reasons that cause cracking in RCC. **(04 Marks)**
   c. A simply supported rectangular beam of 12m span has an effective depth of 800mm. The area of reinforcement required to support the loads is designed as 1.6 percent. Check the deflection control of the beam by empirical method if i) Fe 415 grade HYSD bars are used ii) Fe 500 grade bars are used. **(10 Marks)**

4 Design a singly reinforced concrete beam of clear span 5m to support a design working live load of 10 kN/m. Adopt M20 grade concrete and Fe 415 HYSD bars. Also show the detailing of reinforcements. **(20 Marks)**

PART – B

5 Design RC slab rectangular panel discontinuous and restrained all-round, has an effective spans of 3.5m × 5.0m. Live load is 2 kN/m^2 and floor finish is 0.6 kN/m^2. Use M20 grade concrete and Fe-415 grade steel. All corners are held down. **(20 Marks)**

6 a. A column of size 300 mm × 400 mm is subjected to an axial factored load of 1200 kN and a factored moment of 250 kN-m. Design the column using M25 concrete and Fe 415 steel. Provide 40mm cover. Use of SP–16 is allowed. **(10 Marks)**
   b. Design short column (rectangular) subjected to an axial load of 3000 kN. Take effective length = 3.0m. Use M20 grade concrete Fe 415 grate steel. Check for minimum eccentricity in the direction. **(10 Marks)**

7   A rectangular column of size 350mm × 550mm carries a live load of 1800 kN. The safe bearing capacity of soil is 200kN/m². Using M25 concrete and Fe 415 steel. Design a rectangular footing to support the column. Sketch the details of reinforcement.   **(20 Marks)**

8   The main stair of an office building has to be located in a stair case room measuring 2.5m × 5.6m. The vertical distance between the floors is 3.75m. Live load on stairs 5 kN/m². Design the flight slab using M20 and Fe 415 if flight slab and landing slab span in the same direction.   **(20 Marks)**

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