B.Tech III Year I Semester (R09) Regular & Supplementary Examinations December 2014
DESIGN & DRAWING OF REINFORCED CONCRETE STRUCTURES
(Civil Engineering)

Time: 3 hours   Max Marks: 70

Use of IS 456:2000, SP16 Design aided charts only and IS:875 (Part 1 & Part 2) books is permitted in the examination hall.

PART – A
(Answer any one question, 1 × 28 marks)
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1   Design a slender circular column of 40 mm diameter with the following data:

Unsupported length	= 7 m
Effective length	= 5 m
Axial load	= 600 kN
Moment at top	= 55 kNm
Moment at bottom	= 45 kNm

The column bends in double curvature.
Draw plan and sectional elevation.

2   Design the floor slab for a room measuring 3.5 m x 5.5 m. The slab is to be finished with 20 mm thick terrazzo flooring. The walls supporting the slab are 300 mm thick and the slab is to have a bearing of 180 mm on the walls. The floor may be assumed to be used as a class room floor in primary school. Use M25 grade of concrete and Fe415 grade steel.
      Draw a dimesinonal plan and section of the slab showning the reinforcement details.

PART – B
(Answer any three questions, 3 × 14 marks)

3   (a)   What are the different types of steel commonly used as reinforcements in concrete structure?
    (b)   A simply supported RC beam of 300 mm x 500 mm overall size is reinforced with 2 numbers of 20 mm dia. Fe415 grade steel bars in the tension zone at an effective depth of 460 mm. It carries an u.d.l. of 12.5 kN/m (including its self weight) on an effective span of 5 m. Find out the actual stresses in concrete and steel at mid span section for analysis use working stress method.

4   Determine the neutral axis of cross section for M25 concrete and HYSD Fe415 bars of f_y = 415 N/mm^2. Use parabolic rectangular stress on concrete in compression as suggested by IS 456, and also the limiting strains in the materials as per IS code.

5   A reinforced concrete T-beam section with the details given below is subjected to an external working bending moment of 350 kNm. The characteristic strengths of concrete and reinforcement are 25 and 415 N/mm^2 respectively. Determine whether the cross-section is structurally safe in limit state of strength for the moment given above, b_f = 1.8 m, t = 0.14 m, d = 0.50 m, A_{st} = 3218 mm^2.

6   (a)   Explain the action of a reinforced concrete beam (with shear reinforcement) with the aid of the truss analogy method.
    (b)   A simply supported RC beam of 350 mm x 750 mm overall size and M25 grade concrete carrying an all inclusive u.d.l of 38 kN/m over 6 m span. It is reinforced with 5 bars of 18 mm dia. Fe415 grade steel at its mid span in the tension zone with a clear cover of 35 mm and 4 numbers of 16 mm dia. Bars in the compression zone. Two of the tension bars are bent-up at 45^0 and taken to the top near the supports. Determine the spacing of 10 mm dia. Mild steel stirrups required near the supports.

7   Design a RC footing for a square RC column of 500 mm x 500 mm size which carries an axial load of 1500 kN including its self weight. Use M20 grade concrete and Fe415 steel. The safe bearing capacity of soil may be taken as 220 kN/m^2.

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