Reg. No. : | | | | | | | | | | | |

K 6437

M.E. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2007.

Second Semester

Structural Engineering

ST 1651 — CONCRETE STRUCTURES

(Regulation 2005)

Time : Three hours Maximum : 100 marks

Use of IS 456 – 2000 and SP 16 codes permitted.

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Explain the action of longitudinal steel along with stirrups in resisting torsional stresses in RC beams.
2. In two-way slabs, which of the spans (longer or shorter) is taken for checking deflection? Justify your answer.
3. State under what conditions, P-Δ effect has to be considered in design of buildings.
4. How does bracing affect the behaviour of slender RC columns?
5. Distinguish between ordinary-moment shear walls and ductile-moment shear walls.
6. Which method of analysis of grid floors to be used for the final analysis and design? Justify your answer.
7. Draw a sketch illustrating the location of points of inflection in the case of a rectangular slab with fixed edges.
8. State whether the following statement is true or false and justify your answer.

   The permissible punching shear strength of concrete as per IS code is higher than the flexural shear strength.
9. Name the factors influencing the available rotation at the plastic hinge while performing inelastic analysis.
10. What are the measures used to avoid spalling of concrete with high temperatures?

PART B — (5 × 16 = 80 marks)

11. (a) A Verandah consists of a slab 5 m between edges supported on spandrel beams 200 mm × 600 mm in size, which in turn is carried on 300 mm × 200 mm columns spaced at 7 m centres. Assuming that the total factored load on the slap is 5 KN/m^2 and the slab thickness is 150 mm, determine the design torsional moment in the spandrel beams and the verandah slab. Use M20 grade concrete.

Or

(b) A beam of width 400 mm, depth 700 mm and cover of reinforcement 40 mm is reinforced with 3 rods of 40 mm diameter. Calculate the crack width when the section is subjected to a bending moment of 450 KN-m at the following points.

(i) At a point on the side of the beam 150 mm below the neutral axis.

(ii) At a point midway between bars at the tension face.

Use M25 grade concrete and Fe 415 steel.

12. (a) A column 400 mm × 600 mm in size bent in single curvature is of unsupported length 8 m, and effective length about the major axis is 6 m and about minor axis is 7 m. It is subjected to an axial load (Factored) of 1500 KN along with the following factored moments.

At the top M_{xx} = 175 KN-m, M_{yy} = 75 KN-m

At the botton M_{xx} = 225 KN-m, M_{yy} = 125 KN-m.

Design the reinforcement using M25 grade concrete and Fe 415 steel.

Or

(b) A slender braced circular column bent in single curvature has an unsupported length of 8 m and effective length of 5 m. It is to be 350 mm in diameter and is to carry a factored axial load of 500 KN with factored moments at the top of 40 KN-m and at the bottom of 25 KN-m. Design the reinforcement required using M25 grade concrete and Fe 415 steel.

13. (a) Design a corbel for a 300 mm square column to support a vertical ultimate load of 500 KN, with its line of action 200 mm from the face of the column. Use M20 grade concrete and Mild steel bars.

Or

(b) A simply supported deep beam has an overall depth of 3.5 m and the effective span of 4.65 m. The width of the beam is 250 mm. The beam supports a super imposed load of 225 KN/m over the entire span. Using M20 grade concrete and Fe 415 steel, design the beam and detail the reinforcements.

14. (a) A flat plate with 7.5 m × 6 m panels on 500 mm size square columns has a slab thickness of 180 mm, designed for a total characteristic load of 9.5 KN/m^2. Check the safety of the slab in shear if M25 grade concrete and Fe 415 steel are used for its construction. He can we increase the shear capacity of the slab?

Or

(b) A rectangular slab 8 m in X-direction and 5 m in Y-direction has fixed edges and carried a factored load of 20 KN/m^2. Determine the design bending moment diagrams for typical strips for designing the slab by strip method.

15. (a) The following are the details of an internal beam column of type 1 joint, subjected to reversals which are not due to earthquakes.

(i) Column 600 mm × 600 mm with 8 numbers of 25 mm diameter bars ; Factored load on column = 1400 KN ; Storey height = 3m.

(ii) Beams on either side are 400 mm × 500 mm with 3 numbers of 28 mm diameter bars on the top and 3 bars of 25 mm diameter at the bottom.

Using M25 grade concrete and Fe 415 steel, design the joint.

Or

(b) Explain the steps involved in the Baker's method of plastic analysis and design of a four span continuous T-beam.
