

Seat  
No.

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मजल - 041

## Structural Design & Drawing - I (1010)

P. Pages : 2

Time : Four Hours

Max. Marks : 100

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answersheet should be written with blue ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Solve **any one** question from each unit.
5. Figures to right indicate full marks.
6. Use of calculator & IS 456 is allowed.
7. Assume suitable data where required.

### UNIT - I

1. a) Write assumptions in limit state of collapse in flexure also plot strain diagram & stress block for singly reinforced rectangular beam. **10**
- b) An RC beam of width 300 mm has to resist an ultimate moment of 90 kNm. Find it's overall depth, if depth of neutral axis is restricted to 0.3 d. **10**
- c) Explain over reinforced RC section and state why it is not allowed as per IS code. **5**
2. a) Find maximum service udl, an RC beam of size 250 x 600 mm overall can carry on a simply supported span of 6m. The beam has 4 No 20 mm TOR bars on tension side. Use M25 & Fe 460 grades. **10**
- b) Design a flanged beam for following data : **15**
  - i) Flange thickness = 90 mm
  - ii) Flange width = 1000 mm
  - iii) Width of web = 250 mm
  - iv) Effective depth = 500 mm
  - v) Applied moment = 130 kNm
  - vi) Material grades = M20, Fe415.

## UNIT - II

3. a) Explain mechanism of shear transfer in RC beam. 5
- b) An RC beam 230 x 450 mm overall size has 3 No 20 mm TOR bars on tension side. Assume effective cover of 40 mm. Design vertical stirrups if max SF is 130 kN (ultimate) M20 & Fe415 grades are used. 20
4. A cantilever beam projects 3.5 m beyond fixed end & carries a superimposed load of 15 kN/m. Design a section using M20 & Fe415 grades. Width of support is 300 mm. Also design shear r/f. 25

## UNIT - III

5. Design a sunk RC slab for a public toilet having inside dimension 3 m x 7 m Wall thickness is 300 mm. A waterproofing course of 150 mm is provided It's unit wt is 20 kN/m<sup>3</sup>. Assume a L.L. of 2 kN/m<sup>2</sup>. The slab is simply supported on all 4 sides with corners not allowed to lift. Use M20 & Fe 415 grades. 25
6. Design a dog-legged stair case for an industrial building. Floor to Floor height is 3.2 m The landing is 1.1 m wide & staircase is supported on RC beams at both ends. Assume LL = 4 kN/m<sup>2</sup> FF = 1 kN/m<sup>2</sup> M20 & Fe415 grades. 25

## UNIT - IV

7. a) Design axially loaded square column of size 400 mm x 400 mm for a factored load of 2500 kN Height of column is 3m, hinged at both ends. Use M20 & Fe415 grades. 17
- b) Explain design of rectangular column, subjected to axial load  $P_u$  & ultimate moment  $M_u$ , with the help of interaction diagrams. 8
8. Design an isolated pad footing for a column of size 300 mm x 300 mm, subjected to an axial load of 800 kN. SBC of soil is 200 kN/m<sup>2</sup> Use M20 & Fe415 grades. 25

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