



- Notes :
1. All questions carry marks as indicated.
  2. Solve Question 1 OR Questions No. 2.
  3. Solve Question 3 OR Questions No. 4.
  4. Solve Question 5 OR Questions No. 6.
  5. Solve Question 7 OR Questions No. 8.
  6. Solve Question 9 OR Questions No. 10.
  7. Solve Question 11 OR Questions No. 12.
  8. Due credit will be given to neatness and adequate dimensions.
  9. Assume suitable data wherever necessary.
  10. Illustrate your answers wherever necessary with the help of neat sketches.
  11. Use of non programmable calculator is permitted.
  12. Use of IS 456:2000 & IS 3370 IS Permitted.

1. Design the cylindrical wall of circular water tank for a capacity 3,50,000 liter. The tank is fixed at base and free at top. The depth of water is to be 3.5 m and take free board as 0.35 m use M20 grade of concrete and Fe 415 grade of steel. Draw reinforcement Details. **14**

**OR**

2. Design the wall of square water tank of size 6m x 6m x 3m (L x B x D) for a capacity of 85 m<sup>3</sup> The tank is fixed at base and free at top Use M25 grade of concrete and Fe 415 grade of steel. Draw reinforcement Details. **14**

3. Design biaxially loaded braced rectangular column to carry an ultimate axial load of 2000 kN and ultimate biaxial moment of  $M_{ux} = 250$  kN m and  $M_{uy} = 150$  kN m acting about an axis bisecting the depth and width of column respectively. The effective length about x-axis is 3 m and y axis is 2.75 m The unsupported length about both axis is 3.5 m Take column size 400 x 600 mm. Use M25 concrete & Fe 415 steel. **13**

**OR**

4. Design a footing for column carrying an ultimate load of 1000 kN and ultimate moment of 100 kN. m about an axis bisecting the depth of Column at its base The size of column is 300 x 600 mm and S.B.C of Soil 180 kN/m<sup>2</sup> Use M20 concrete and Fe 415, Draw reinforcement details. **13**

5. a) Explain redistribution of moments state its advantages. **5**
- b) Draw bending moment dia. for fixed beam of span 6 m carrying 12 kN load at one third point, after 20% redistribution of moment. **8**

**OR**

6. A continuous beam of two span 7 m each carries a factored dead load of 10 kN/m and factored live load 25 kN/m. Draw bending moment diagram envelopes after 30% maximum redistribution. **13**
7. Design stem wall of a cantilever retaining wall for a road with the following requirement. **13**
- Height of stem = 4.5 m
  - Back fill is leveled
  - Unit wt. of fill = 16 kN/m<sup>3</sup>
  - Angle of internal friction for fill material = 30°
  - S. B. C. of soil = 170 kN/m<sup>2</sup>
- Use M20 grade of concrete and Fe 415 grade of steel. Draw reinforcement Details.

**OR**

8. Design a stem of a counter-forts retaining wall of 6.8 m height The counter forts are 300 mm thick with the center to center distance between the counter-forts is 3.0 m The safe bearing capacity of soil is 180 kN/m<sup>2</sup>, unit wt of soil is 18 kN/m<sup>3</sup> and the angle of shearing resistance is 30°. Use M20 grade of concrete and Fe 415 steel. Draw reinforcement Details. **13**
9. Design the beam of portal frame hinged at base to suit following data. **13**
- Spacing of portal framed = 4 m
  - Height of columns = 4 m
  - Distance between column centers = 10 m
  - Live load on roof = 1.5 kN/m<sup>2</sup>
- R. C. C. slab continuous over portal frames. SBC of soil at site = 160 kN/m<sup>2</sup>  
Adopt M20 grade of concrete and Fe 415 steel. Draw reinforcement details.

**OR**

10. Design a doglegged stair case for a building in which vertical distance between floor is 3.2 m The stair case hall measures 2.5m x 5m. Take live load 2.5 kN/m<sup>2</sup>. Use M20 grade of concrete and Fe 415 steel. Draw reinforcement details. **13**
11. Design a combined footing for two columns 3.6 m C/C apart carrying load of 850 kN and 1100 kN at service. The size of column 350 x 350 mm and 450 x 450 mm respectively. The length of footing is restricted to 5.5 m Take SBC of soil as 180 kN/m<sup>2</sup>. Use M20 Concrete and Fe 415 steel. Draw reinforcement details. **14**

**OR**

12. Design a combine footing for two column 4 m C/C apart carrying load 800 kN and 1200 kN at service. The size of column 400 x 400 mm and 400 x 400 mm respectively. The width of footing is restricted to 2.0 m. Take SBC of soil as 180 kN/m<sup>2</sup>. Use M25 grade of concrete and Fe 415 steel Draw reinforcement details. **14**

Part COMPRESSION WITH BENDING – Rectangular Section – Reinforcement Distributed Equally on Four Sides



