



- 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 whenever necessary.
 10. Illustrate your answers whenever necessary with the help of neat sketches.
 11. Use of non programmable calculator is permitted.
 12. Use of IS 456:2000 & IS3370 is permitted.

1. A Circular water tank of capacity 500000 liters resting on a firm ground and having rigid joint at the base. The depth of water is 4m, including a free board of 200mm. Design top dome and circular wall of tank. Use M20 grade of concrete and Fe 415 grade steel. **13**

OR

2. Design the rectangular water tank 6m x 5m with depth of storage 3.5m, resting on firm ground whose walls are fixed at base and free at the top. Design the walls of water tank by using IS code method or by approximate method. Adopt M20 concrete and Fe 415 grade steel. **13**
3. Design the reinforcement for a column with $l_{ex} = l_{ey} = 4.0m$ and size 400mm x 300mm. Subjected to a factored load of 1000 kN with biaxial moment of 120kN-m and 80 kN-m w.r.t. the major axis and minor axis respectively. Assume M20 concrete and Fe 415 steel. Interaction curve may be consulted. **13**

OR

4. Design an isolated footing for a column 400mm x 300mm transmitting a load of 950kN and moment of 80kN-m. The SBC of soil is $190kN/m^2$. Use M 20 grade of concrete and Fe 415 grade of steel. **13**
5. Draw elastic moment diagram and bending moment diagram after 30% moment redistribution for a two span continuous beam of span 8m each subjected to udl of 30kN/m on entire span. **13**

OR

6. a) State the advantages of Moment Redistribution Method. **4**

- b) Draw bending moment diagram for fixed beam of span 6m carrying two collapse point loads of 20kN each, acting at one third points, after 20% redistribution of moments. **9**
7. A cantilever retaining wall is to retain earth for a height of 4.0 m above ground level. The back fill is horizontal. Density of soil is 18kN/m^3 and SBC of soil is 200kN/m^2 . Take coefficient of friction between soil and concrete as 0.65 and angle of repose is 30° . Use M20 concrete and Fe 415 steel. Carry out stability analysis and design the **Stem** and **Toe** slab and Sketch reinforcement details. **14**

OR

8. A counterfort retaining wall to retain 6.5 m high embankment above ground level. The foundation is to be taken 1.5m below ground level where the bearing capacity of soil may be taken as 200kN/m^2 . The backfill is horizontal and soil have density of 17kN/m^3 with angle of internal friction 30° . Coefficient of friction between concrete and soil may be taken as 0.5. Design the Stem of counterfort retaining wall. Use M 25 grade of concrete and Fe 415 steel. **14**
9. The roof of 8m wide hall is supported on a portal frames spaced at 4m intervals. The height of the portal frame is 4m. The continuous slab is 100mm thick. Live load on roof is 2.5kN/m^2 , SBC of soil = 200kN/m^2 . The column are hinged at base. Design the Column and Hinge of the portal frame. Use M20 grade concrete and Fe 415grade steel. **13**

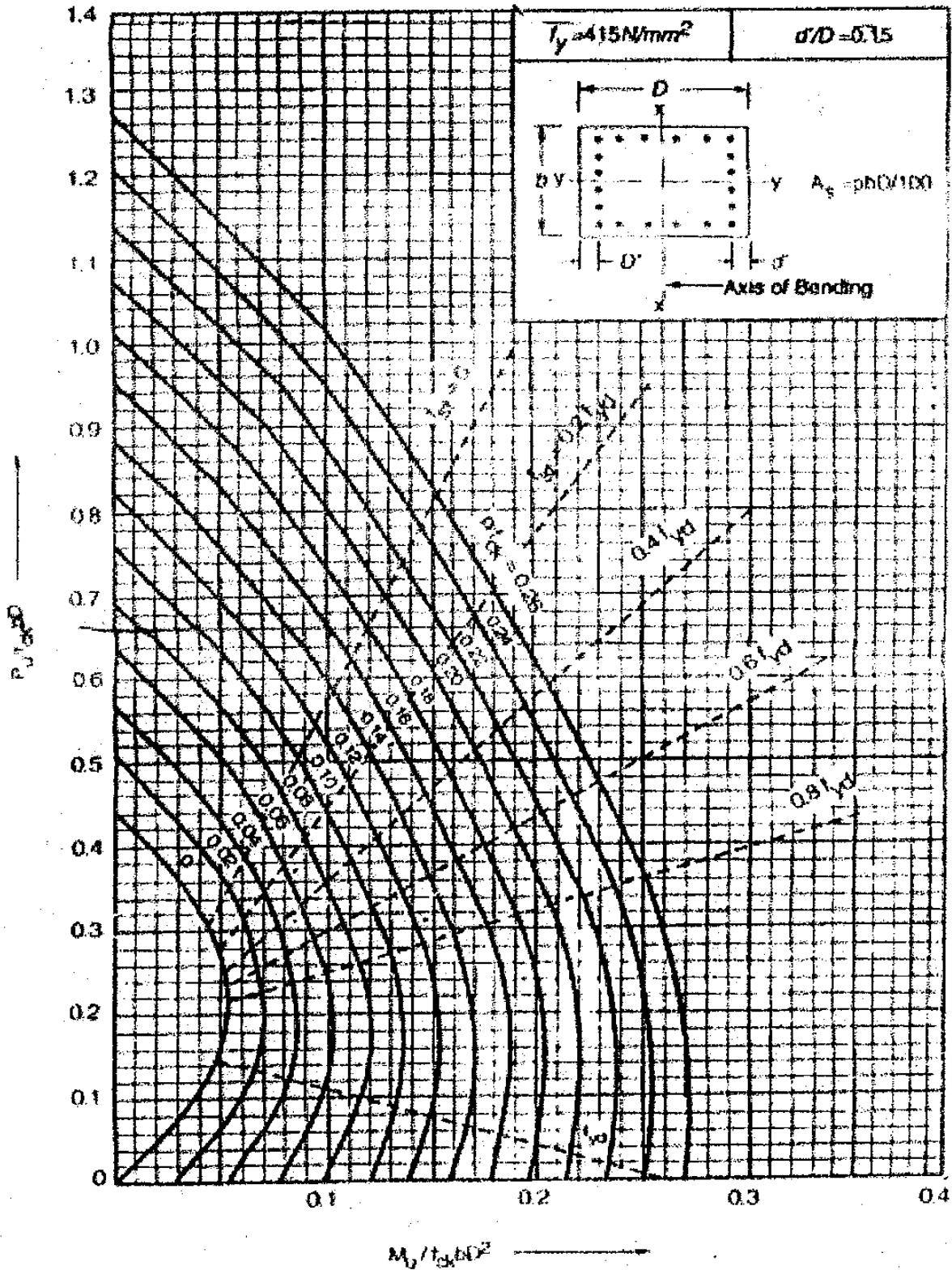
OR

10. Design a dog legged staircase for a residential building hall measuring 2.5m x 4.0m. The distance between floor to floor is 3.6m. The weight of floor finish is 1.5kN/m^2 and live load may be taken as 3kN/m^2 . Use M20 grade concrete and Fe 415 steel. Flight spans longitudinally. **13**
11. Design a combined rectangular footing for two column A and B carrying loads of 1000 kN each at service. The size of both columns is $400\text{mm} \times 400\text{mm}$. The centre to centre distance of column is 4.0m. Take SBC of soil as 180kN/m^2 and unit weight of soil as 18kN/m^3 . Angle of repose = 30° Use M20 grade concrete and Fe415 steel. **14**

OR

12. Two columns A and B spaced at 5m center to center. Column A, 300mm x 300mm in size and carries load of 550kN and is on property line. Column B 400mmx400mm in size, carries a load of 800kN. The Bearing capacity of soil is 120kN/m^2 . Design the **footing slab** for the strap beam footing. Use M20 mix and Fe415 steel reinforcement. **14**

Interaction Diagram for Combined Bending and Compression
 Rectangular Section - Equal Reinforcement on Four Sides



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 Rectangular Section - Equal Reinforcement on Four Sides

