B.E. (Civil Engineering) Fifth Semester (C.B.S.)

Reinforced Cement Concrete (RCC) Structures

P. Pages : 2 **TKN/KS/16/7407**

Time : Four Hours * 0 9 1 0 * Max. Marks : 80

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. Diagrams should be given whenever necessary.
11. Illustrate your answers whenever necessary with the help of neat sketches.
12. IS 456 : 2000, IS 875 may be consulted.

1. a) Derive design constant (k, j & R) for neutral axis, lever arm and moment of resistances constant for singly reinforced beam. Also calculate the values of k, j & R for M 25 grade concrete and Fe 415 grade of steel. [By WSM]. **6**

b) RCC beam 300 mm x 640 mm overall is reinforced with 4 bars of 20 mm diameter. The beam has to carry a super imposed land of 50 KN/m including self weight of the beam over an effective span of 4m. Find the actual stresses developed in steel and concrete. The effective cover is 40 mm. Take modular ratio m = 13.33. Also find the compressive stress in concrete at 50 mm from top of the beam and draw bending stress diagram. **8**

OR

2. a) A rectangular beam of width 350 mm is subjected to a uniformly distributed land of 15 KN/m over an effective span of 8 m. Determine the depth require for the beam and also calculate the area of tensile reinforcement required. Use M 20 concrete and Fe 250 grade of steel. Draw reinforcement details. [WSM]. **8**

b) Explain under reinforced, over reinforced and balance section in WSM by deriving the equation of moment of Resistances. [WSM]. **6**

3. a) A rectangular concrete beam of cross section 300 mm deep and 200 mm wide is prestressed by means of 15 wires of 5 mm diameter located 6.5 cm from the bottom of the beam and 3 wires of diameter 5mm, 2.5cm from the top. Assuming the prestress in steel as 840 N/mm^2. Calculate the stresses at the extreme fibers of the midspan section when the beam is supporting its own weight over a span of 6m. If uniformly distributed live load of 6 KN/m is imposed. Evaluate the maximum working stress in concrete. The density of concrete is 24 kN/m^3. **7**

b) Explain the advantage of prestressed concrete over RCC. **6**

OR

4. a) Explain with the help of neat sketches any two prestressing systems. **6**

b) Explain Pre – tensioning and Post tensioning. **3**

c) Explain different types of losses in prestress concrete. **4**

5. a) Explain : **6**

i) Stress strain relationship for concrete.

ii) Stress strain relationship for steel in LSM.

b) A rectangular beam is 20cm wide and 40cm deep up to the centre of reinforcement. Find the area of reinforcement require if it has to resist a moment of 25 kN/m. Use M 20 concrete mix and Fe 415 steel. Also give check for sectors. **7**

OR

6. a) Derive Equation for limiting Moment of resistances for balanced, underreinforced and over reinforced section by LSM of singly reinforced beam. **6**

b) A rectangular beam has a width of 250 mm and effective depth of 500 mm. The beam is provided with tension steel of 5 bars of 25 mm diameter and compression steel of 2 bars of 25 mm diameter. The effective cover to the compression steel being 50 mm. Calculate the ultimate moment capacity of the section of fek = 20 MPa and fy = 250 MPa. **7**

7. Design a short column of reinforced concrete to carry an axial land of 1150KN. Width of the column is restructed to 300mm. Also Design a rectangular footing of uniform thickness for an axial lended column of 1150 KN. Safe bearing capacity of soil is 200 kN/m^2. Use M20 concrete and Fe 415 grade of steel. **13**

OR

8. a) A simply supported T beam has flange width of 2400 mm and flange thickness of 120 mm. The effective span of beam is 3.6m. The effective depth of beam is 580 mm and its width 300 mm. It is reinforced with 8 – 20 mm diameter, Fe 415 grade steel. Determine the moment of resistances of the section. Use M 20 grade of concrete. **6**

b) Design a circular column of diameter 400 mm subjected to a load of 1200 KN. The column is having spiral ties. The column is 3 m long and is effectively held in position at both ends but not restrained against rotation. Use M25 concrete and Fe 415 steel. **7**

9. a) A RCC beam 250 x 500 mm has a clear span of 5.5 m. The beam has 2 – 20 mmϕ bars going in to the support. Factored shear force is 140 KN. Check for development length of Fe 415 and M 20 grade of concrete is used. **6**

b) Explain in brief the various measure for deflection control as per IS 456 : 2000. **7**

OR

10. a) A simply supported beam 300 mm x 600 mm effectives is reinforced with 5 bars of 25 mm dia bars. It carries a uniformly distributed load of 80KN/m over an effective span of 6m. out of the 5 main bars two bars can be bent up safely near the supports. Design the shear reinforcement for the beam. Use M 20 grade concrete and Fe 415 steel. **6**

b) Explain causes and control of cracks in RCC structure. **7**

11. A simply supported slab of a corridor of a hospital building has a clear span 2.5m and is supported on beams 230 mm width. Design the slab carrying live load of 3 kN/m^2 and floor furnish load 1 kN/m^2. Use M20 concrete and MXSD Fe 415 steel. **14**

OR

12. Design a RCC slab for a room measuring 4m x 6m. The slab is simply supported on all the four edges with corners held down. It carries a super imposed load of $6000\,N/m^2$ inclusive of floor finishes etc. Use M20 concrete and Fe 415 steel. **14**

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