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

Reinforced Cement Concrete (RCC) Structures

P. Pages : 3 **KNT/KW/16/7319**

Time : Four Hours * 0 6 4 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. Illustrate your answers whenever necessary with the help of neat sketches.
11. IS 456: 2000, IS 875 may be consulted.

1. a) Explain under reinforced, over reinforced and balance section in WSM by deriving the equation of moment of resistances. **6**

b) Calculate the moment of resistance of the singly reinforced beam by working stress method. The width and effective depth are 450mm, 715mm. It is reinforced with 8 Numbers of mild steel bars having dia 20mm assuming M20 grade concrete. **7**

OR

2. a) Design a beam subjected to a bending moment of 60kNm by working stress design. Adopt width of beam equal to half the effective depth. Assume the permissible stresse in the concrete and steel are not to exceed 7 N/mm^2 and 140 N/mm^2 , take m = 13.33. **7**

b) Derive design constant (k, j & Q or R) for neutral axis lever arm and moment of resistances constant for singly reinforced beam. Also calculate the values of k, j & R for M25 grade concrete and Fe415 grade of steel. **6**

3. a) What are the various systems of prestressing and explain briefly. **10**

b) Explain Pre-tensioning and post tensioning. **4**

OR

4. a) Explain the advantage of pre stressed concrete over RCC. **6**

b) A pre-tensioned beam of cross section 120mm deep and 80mm wide is to be designed to support working loads of 4 kN, each concentrated at the third points over a span of 3m. If the permissible stresses in tension are zero at transfer and 1.4N/mm^2 under working loads, design the numbers of 3mm wires and the corresponding eccentricity required at the mid span section. Permissible tensile stress in wires is 14000N/mm^2 . The loss of prestress is 20% and density of concrete is 24kN/m^3 . **8**

5. a) Design a RC beam 350×700mm effective section, subjected to a bending moment of 300kNm. Adopt M20concrete and Fe415 steel. Sketch reinforcement details. **7**

b) Determine Moment of Resistances of a rectangular section reinforced with a steel of area $600mm^2$ on the tension side. The width of the beam is 200mm, effective depth 600mm. The grade of concrete is M20 & Fe250 grade steel is used. **6**

OR

6, a) A singly reinforced beam $230mm \times 600mm$ is reinforced with 4 bars of 16mm dia with an effective cover of 50mm. effective span is 4m. Assuming M20 concrete & Fe415 steel, find the value of central load P that can be carried by the beam. **7**

b) Derive Equation for limiting depth of neutral axis and moment of resistances for balanced, under reinforced and over reinforced section by using LSM. **6**

7. a) Calculate the depth of neutral axis and ultimate moment of resistance of T beam section for the following data. **7**
Flange width = 800 mm,
Flange thickness = 150mm,
Web width = 300mm
Effective depth = 420mm
Area of tension reinforcement = $14701mm^2$
Assume = M 25 grade concrete and Fe 415 grade of steel.

b) Design a circular column of diameter 500mm subjected to a load of 1350 KN. The column is having spiral ties. The column is 3.5m long and is effectively held in position at both ends but not restrained against rotation. Use M20 concrete and Fe 415 steel. **6**

OR

8. Design the reinforcement in a circular column of diameter restricted to 450 mm with helical reinforcement of 8mm diameter to support a factored load of 1500 kN. The column has unsupported length of 3.5m and is braced against sideway. Also design a rectangular footing of uniform thickness for an axial loaded column of 1500 KN safe bearing capacity of soil is 200 kN/m^2 Use M20 concrete and Fe 415 grade of steel. **13**

9. a) A rectangular beam of 350mm wide and 550mm effective depth is reinforced with 6 numbers of 20 mm diameter bars out which three bars have been bent up at 450. Determine the shear resistances of the bent up bars and the additional shear reinforcement required if it is subjected to an ultimate shear force of 300 kN. Use M20 grade concrete and Fe 415 grade of steel. **7**

b) Explain causes and control of cracking in concrete due to loading temperature and Shrinkage. **6**

OR

10. a) A RCC beam 230 x 450 mm has a clear span of 5m. The beam has 2 x 20 mm and bars' going into the support, factored shear force is 125 kN. Check for development length of Fe 415 and M20 grade of concrete is used. **6**

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

11. Design a simply supported one-way slab over a clear span of 3.5m. It carries a live load of $4 kN/m^2$ and floor finish of $1.5 kN/m^2$. The width of supporting wall is 230mm. Adopt M-20 concrete & Fe-415 steel. **14**

OR

12. Design a R. C Slab for a room measuring 6.5m X 5m. The slab is cast monolithically over the beams with corners held down. The width of the supporting beam is 230 mm. The slab carries superimposed load of $4.5 kN/m2$. use M-20 concrete and Fe-500 Steel. **14**

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