B.E. Civil Engineering (Model Curriculum) Semester - V

PCC-CE506 - Design of RCC Structure-I

P. Pages : 2 **GUG/S/23/13729**

Time : Four Hours * 2 4 6 5 * Max. Marks : 80

Notes :
1. Due credit will be given to neatness and adequate dimensions.
2. Assume suitable data wherever necessary.
3. Diagrams and Chemical equation should be given wherever necessary.
4. Illustrate your answers wherever necessary with the help of neat sketches.
5. I.S. Hand Book for structural steel section, I.S. Code 8000/1962 or 1964, I.S. 456 (Revised), I.S. 875 may be consulted.
6. Retain all construction lines.

1. a) State the limitations and assumptions in WSM. **6**

b) Calculate the moment of resistance of the singly reinforced beam by working stress method. The width and effective depth are 450 mm and 700 mm. It is reinforced with 6 Nos. of mild steel bars of 18 mm dia. Assuming M_{25} grade of concrete. **7**

OR

2. a) Derive design constant (k, j & R) for neutral axis, lever arm and moment of resistance constant for singly reinforced beam. Also calculate the values of k, j and R for M_{25} grade of concrete and Fe_{500} grade of steel. **6**

b) Determine the moment of resistance of singly reinforced beam of 150 mm wide and 250 mm deep to the centre of reinforcement. If the stresses in steel and concrete are not exceed $140\,N/mm^2$ and $5\,N/mm^2$ (i.e. $\sigma_{st} = 140\,N/mm^2$ and $\sigma_{cbc} = 5\,N/mm^2$). The reinforcement consist of 6 bars of 18 mm dia. Take M = 18 and effective span is 5.5 m. **7**

3. Design the shear reinforcement for a rectangular beam 250 mm x 400 mm (effective) reinforced with 4 bars of 16 mm diameter. The beam is subjected to a factored shear force 90 kN. Use M_{20} grade of concrete with Fe_{415} steel. **13**

OR

4. Design singly reinforced rectangular beam for a effective span of 7 m subjected to live load of 15 kN/m over entire span. Calculate main reinforcement and shear reinforcement. Give all necessary checks as per IS 456 : 2000. Draw neat reinforcement sketch. **13**

5. a) A T-beam floor system has 120 mm thick slab (Df) supported on beams. The width of beam is (bw) = 300 mm & effective depth is 580 mm (d), the beam is reinforced with 8 bars of 20 mm. Use M_{20} grade of concrete and Fe_{415} steel the beam are spaced 3 m centre to centre the effective span of beam is 3.6 m. **7**

b) Design RCC column having unsupported length of 5.5 m subjected to axial compressive load of 1200 kN. Use M_{20}, Fe_{415}. **7**

OR

6. Find the maximum short term deflection for a simply supported prismatic beam carrying 50 kN/m, Udl on RHS half eff. Span of 2.5 m and 10 kN point load at midspan b = 250 mm, d = 650 mm, d′ = 50 mm. $A_{st} = 3$ bars of $16\,mm\,\phi$, $A_{sc} = 2$ bars of $16\,mm\,\phi$, $F_{ck} = 20\,MPa$, $F_y = 415\,MPa$. **14**

7. a) A Pretensioned beam, 200 mm wide and 300 mm deep, is prestressed by 10 wires of 7 mm diameter initially stressed to $1200\,N/mm^2$ with their centroids located 100 mm from the soffit find the maximum stress in concrete immediately after transfer, allowing only for elastic shortening of concrete. **13**

b) Explain the various types of losses in pre-tensioning. **7**

OR

8. Design a rigid base rectangular water tank with cover slab to store 2 lac liters water, resting on ground. $F_{ck} = 25\,MPa$, $F_y = 500\,MPa$, SBC of soil is $280\,kN/m^2$. Use aspect ratio 1.4. Assume free board 300 mm. Use IS code method sketch reinforcement details. **20**

9. Design a slab for room 4m x 9.5m carrying L.L. of $2.0\,kN/m^2$ and floor finish load of $1\,kN/m^2$. Wall thickness (b) = 230 mm. $F_{ck} = 20\,MPa$, $F_y = 415\,MPa$. Use load factor 1.5 sketch R/F details. **20**

OR

10. Design a pad footing for column 400 x 550 mm carrying an axial load of 1200 kN. SBC of soil is $200\,kN/m^2$. Use M_{20} concrete and Fe_{415} steel. Draw a neat reinforcement sketch. **20**

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