M.E. Second Semester (Civil (Structural Engineering)) (New-CGS)

13094 : Design of Prestressed Concrete Structure : 2 SFSE 4

P. Pages : 2 | **AW - 3892**

Time : Four Hours | Max. Marks : 80

Notes :
1. Answer **Two** question from Section A and **Two** question from Section B.
2. Due credit will be given to neatness and adequate dimensions.
3. Assume suitable data wherever necessary.
4. Illustrate your answer necessary with the help of neat sketches.
5. I.S. 1343, IS 3370, IS 1678 may be consulted.

SECTION -A

1. a) Explain with neat diagram load Balancing concept" **4**

b) A prestressed concrete beam of rectangular section 300 x 600 mm deep, is prestressed by two post tensioned cable of area 650mm^2 each initially stressed to 1600. The cable are located at a constant eccentricity of 100mm. The span of beam is 12m. Calculate the ultimate shear resistance of support section un cracked in flexure if concrete grade is 40. **8**

c) The support section of prestressed concrete beam 175 mm wide and 300mm deep is required to support an ultimate shear force of 125kN. The compressive prestress at the centroidal axis is 5 N/mm^2. The cover to the tension reinforcement is 45mm. Design suitable shear reinforcement using IS 1343 recommendation. **8**

2. Design a type I prestressed beam with rectangular cross section from first principle and check for allowable stresses for following data. **20**

Effective span – 12 m (Simply supported)
Superimposed load – Dead load – 10 kN/m.
– Live Load – 20 kN/m.
Grade of concrete – M 40
Prestressing steel with $F_p = 1500\,MPa$

If check for stresses are not satisfied modify the section for one more trial.

3. a) A 14m span pre-stress concrete beam of uniform rectangular c/s supports total imposed load of 240kN (Excluding Self-weight) which is uniformly spread ever the span. Design for M:50 grade concrete, if the effective pre-stress in tendon is 1100 N/mm^2. Assume TYPE – I structure. Only basic design for flexure is required. Check for shear & ultimate load is not necessary. Draw details including intentioned steel. **10**

b) A two span continuous prestressed beam ABC comprises of two identical spans of 15m each. support A & C are roller support. The beam c/s is 250mm x 600mm throughout. The cable carrying an effective prestressing force of 500kN is parallel to the axis of the beam & located at an eccentricity of 200mm **10**

i) Determine the secondary & resultant moment developed at the mid support B.
ii) If the beam support an imposed load of 2.4kN/m, calculate the resultant stresses developed at the top & Bottom of the beam at B. Also calculate line of thrust.

SECTION – B

4. Design a 25 lakhs litre circular water tank having flexible base. The base slab rest over firm ground concrete grade is M:40 $F_{ci} = 32\ N/mm^2$. & Take $D/H = @4$ for the tank. Use 4ϕ wire having $F_p = 1750\ N/MM^2$ for circular prestressing. Use $12 \times 5\phi$ standard Freyssinet cable having $F_p = 1600\ N/mm^2$ for vertical Prestressing. The losses = 20% Draw detail. Use limit state method. **20**

5. Design a 12m tall pre-tensioned TYPE – 2 pole to carry four electric cable of 9mm ϕ, if the concrete grade is M : 50 use 5ϕ high tensile wire having $F_p = 1600\ N/mm^2$. Assume design wind pressure of $1kN/m^2$, 25% losses, underground implant length of 2m. c/c spacing of pole = 60m. The pole c/s is non-prismatic but rectangular throughout. Take width of pole b = 150mm throughout. Take $F_{ci} = 25N/mm^2$ Draw details. **20**

6. Design a post-tensioned pre-stressed concrete girder, simply supported at its ends for the following data. **20**

1) Effective span = 16m.
2) Super imposed D.L. = 23.52 kN/m excluding self weight.
3) Super imposed L.L. = 18 kN/m.
4) Concrete grade = M : 40
5) Losses = 15 %.
6) Assume TYPE 2 structure.
7) $F_p = 1500\ N/mm^2$.

Design an I-Section for limit state of flexure alone. Draw details. End block design is not necessary.

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