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

13094 : Design of Prestressed Concrete Structure : 2 SFSE 4

P. Pages : 2
Time : Four Hours

AW - 3621
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. IS 1343, I.S. 3370, IS.1678 may be consulted.
6. Use of pen Blue/Black ink/refill only for writing the answer book.

SECTION - A

1. a) Make a comparison between pre-tensioned and post-tensioned concrete. **4**

b) A rectangular beam of $200\text{mm} \times 300\text{mm}$ c/s is prestressed by means of 15 wires of 5ϕ located at 65mm from bottom and 3 wires of $5\text{mm}\phi$ located at 25mm from top. Assuming the residual prestress in steel as 840 N/mm^2. Calculate the extreme fibre stresses for the midspan section. **8**

The simply supported beam is 6m long and support an imposed load of 6 kN/m (excluding self weight)

c) A post tensioned bounded T-Section has a flange 1500mm wide and 200mm thick. The width and the effective depth of the rib are 300 & 1800mm respectively. Calculate the ultimate flexural strength of the T-section by taking **8**

$fp = 1600 \text{ N/mm}^2$, $A_p = 5000\text{mm}^2$, $d = 1800\text{mm}$ and concrete M:40

2. a) The end block of post tensioned beam $300 \times 750\text{mm}$ deep. Two cables each comprising $50 - 8\phi$ high tensile wire carrying a force of 2500kN are anchored using 300×300 size anchored plate. The plates centres are located symmetrically at 300mm from top and 300mm from bottom edge of the beam. Using IS code recommendation, design suitable reinforcement in end block using Fe-415. Also check for bearing stresses if concrete grade is M:50. **14**

b) Define "Transmission Length" and enlist factors affecting the deflection of a pre-stressed concrete beam. **6**

3. a) A two span continuous prestressed concrete beam ABC comprises of two identical span of 10m each. Supports A & C are roller supports. The beam c/s is $100\text{mm} \times 300\text{mm}$ throughout. The cable carrying an effective pressuring force of 360kN varies linearly with an eccentricity of 50mm towards the soffit at end supports and eccentricity of 50mm toward top at mid support B. **16**

i) Determine the resultant moment at the mid support B due to prestress.
ii) If the eccentricity of the cable at B is +25mm, show that the cable is concordant.

b) Define concordant cable and cap cable. **4**

SECTION - B

4. Design a 50 lac litre circular water tank having rigid base. The base slab rest over firm ground concrete grade is M:40 and $fci = 32\,N/mm^2$, Take D/H = @4 for the tank, Use 5ϕ wires having $fp = 1700\,N/mm^2$ for circular prestressing. Use 12×5 standard freyssinet cable having $fp = 1600\,N/mm^2$ for vertical prestressing. Take losses = 20% Draw details. **20**

5. An electric line pole is 8m in length and is subjected to 1800N wind force at a height 6.5m above GL. The pole projects 0.3m above the level of wires and embedded 1.2m in to the ground. Design the pretensoined pole such that it can withstand 1800N wind force on the wires and 450N force along with direction of the wires. Take fck = 40 MPa, fci = 30MPa & fp = 1600MPa. Design the pole as TYPE I Structure. **20**

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

   1) Effective Span = 18m
   2) Superimposed DL = 23.25kN/m excluding self weight.
   3) Super imposed L.L = 18 kN/m
   4) Grade of concrete M:40
   5) Losses = 15%
   6) Assume type - 3 structure
   7) $fp = 1600\,N/mm^2$

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

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