[Time: 3 Hours] **[Marks: 80]**

Please check whether you have got the right question paper.

N.B:
1. Question no. 1 is compulsory.
2. Solve any **three** questions from the remaining questions.
3. Assume suitable data if required.
4. Use of IS 1343 is permitted.

Q.1 a) What is the necessity of using high strength concrete and high tensile steel in prestressed concrete? **05**

b) Distinguish between pre-tensioned and post-tensioned members. **05**

c) Sketch the typical tensile stress distribution in an end block of post-tensioned beam with a single anchorage. **05**

d) What are the advantage of continuous members in prestressed concrete structures? **05**

Q.2 a) A pre-tensioned beam 250mm wide and 300mm deep is prestressed by 12 wires each of 7mm dia. Initially stressed to 1200 N/mm^2 with their centroids located 100mm from the soffit. Estimate the final % age loss of stress using following data
Es = 210 KN/mm^2 and Ec = 35 KN/mm^2 Relaxation of steel stress = 90 N/mm^2 creep co-efficient (Φ) = 1.6. Residual shrinkage strain = $3x10^{-4}$ **10**

b) A PSC beam with a rectangular section 200 mm x 450 mm support udl of 10 KN/m. the effective span of beam is 5m. the beam is concentrically prestressed by a cable carrying a force of 200 KN. Locate the position of the pre line in the beam. **10**

Q.3 A PSC beam having size 200mm x 300mm span 3m. the beam is prestressed by a straight cable containing five wires of 7mm dia. Stress to 1000N/mm^2 at an eccentricity of 50mm. Assume modular ratio α = 6, Ec = 34 KN/mm^2 and modulus of rupture is 5 N/mm^2. Calculate the max. deflection of the beam at the following stages. **20**

a) Prestress + self wt of the beam
b) Prestress + self wt + imposed load of 10 KN/m
c) Cracking load

Q.4 a) A pre-tensioned prestressed concrete beam having size 200x400mm has an effective cover of 50 mm. if fck = 40 N/mm^2, fp = 1600 N/mm^2 and Area of prestressing steel Ap = 500 mm^2. Calculate the ultimate fiexural strength of the section using IS 1343 code provision. **10**

b) A PSC beam having span 5m and size 230 x 450 mm is axially prestressed by a cable carrying an effective force of 300 KN. The beam supports a total udl 20 KN/m including self wt. compare the magnitude of the principal tension developed in the beam with and without the axial prestress. **10**

Q.5 Design a post tensioned roof girder to suit the following data **20**

Effective span = 20mm
Live load = 10 KN/m
Dead load (excluding self wt) = 2 KN/m
Load factors for DL = 1.5
For LL = 2.0
Cube strength of concrete Fcu = 50 N/mm^2
Cube strength at transfer Fci = 50 N/mm^2
Tensile strength of cone = ft = 1.7 N/mm^2
Ec = 34 KN/m^2. Loss ratio = 0.8.
Only check for minimum section modulus and check for prestressing force.

Q.6 A continuous PSC beam ABC, AB = BC = 15m has a cross section 230mm x 400mm. The cable carrying an effective prestressing force of 400 KN is parallel to the axis of the beam and located at 100mm from the soffit. **20**

a) Determine the secondary and resultant moment at the central support B.
b) If the beam support an imposed load of 10 KN/m. calculate the resultant stresses at top and bottom of the beam at B.
c) Locate the resultant line of thrust through beam AB.

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