CBCS SCHEME

USN

15CV82

Eighth Semester B.E. Degree Examination, Jan./Feb. 2023
Design of Pre-Stressed Concrete Elements

Time: 3 hrs. Max. Marks: 80

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Use of IS 1343 is permitted.
3. Use of IS 1343-1980 and IS 1343:2012 code books are permitted.
4. Assume any missing data suitably.

Module-1

1 a. Differentiate between pre-tensioning and post tensioning. **(08 Marks)**

b. List the advantages and disadvantages of prestressed concrete over RCC. **(08 Marks)**

OR

2 a. Explain (i) Tendon (ii) Concentric tendon (iii) Eccentric tendon (iv) Pressure line. **(08 Marks)**

b. A rectangular concrete beam 100mm wide and 250mm deep spanning over 8m. It is prestressed by a straight cable at an eccentricity of 40mm with a prestressing force of 250kN. It carries a live load of 1.2 kN/m. Calculate the resultant stress distribution at the centre of the beam. Take density of concrete as 24 kN/m^3. **(08 Marks)**

Module-2

3 a. Explain various losses in prestressed concrete with the equations. **(08 Marks)**

b. Find the percentage loss of prestress for the following data [Refer Fig.Q3(b)] :

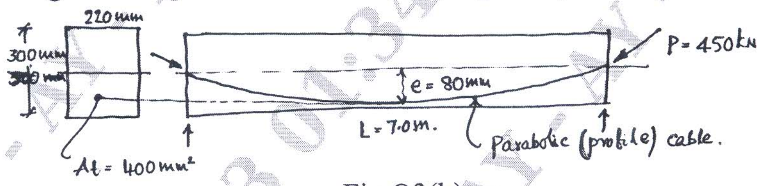

Fig.Q3(b)

$E_{Steel} = 2.1\times10^5$ MPa ; $E_C = 0.333\times10^5$ MPa
Creep coefficient = 2 ; Shrinkage strain = 0.0002
Anchorage slip = 1.8mm ; Relaxation of steel = 3% **(08 Marks)**

OR

4 a. List the factors affecting deflection of PSC beam and explain load-deflection characteristics. **(08 Marks)**

b. A PSC beam of Rectangular section is shown in Fig.Q4(b). The cable is straight with eccentricity 50mm. E_c = 36 kN/mm^2. LL on beam is 4 kN/m. Find the deflection due to prestress, self weight and LL; Take creep coefficient 1.8. Find also long term deflection.

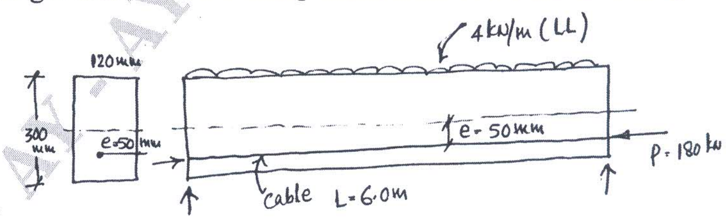

Fig.Q4(b) **(08 Marks)**

Module-3

5 a. Calculate the ultimate moment capacity of a pre-tensioned section of size 300mm × 500mm with an effective cover as 100mm. Take characteristic strength of concrete 42 N/mm^2 and f_{Pu} = 1900 N/mm^2 with A_{Ps} = 600mm^2. **(08 Marks)**

b. Find the ultimate moment of Resistance of T-beam shown in Fig.Q5(b). Area of prestressing steel (A_{Ps}) 4700 mm^2 ; f_{ck} = 40 N/mm^2 ; f_{Pu} = 1600 N/mm^2 ; d = 1600 mm.

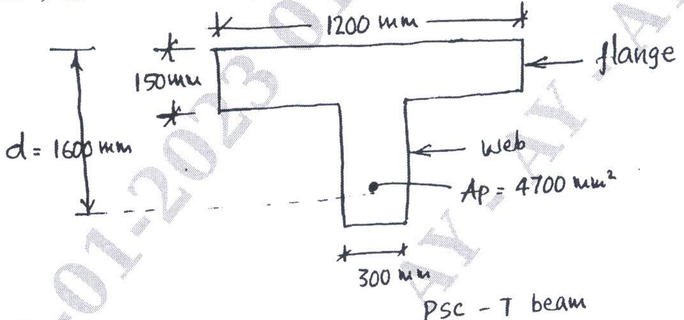

Fig.Q5(b) **(08 Marks)**

OR

6 a. Explain the modes of flexural failure in PSC beam. **(08 Marks)**

b. A pre-tensioned concrete beam of rectangular section subjected to an ultimate bending moment of 100 kN-m. Design the section. f_{ck} = 50 N/mm^2. f_p = 1600 N/mm^2. Assume b = d/2 and x_u/d = 0.5. **(08 Marks)**

Module-4

7 a. Explain the various shear cracks in PSC beam. **(08 Marks)**

b. A PSC beam of span 10m rectangular in cross section 120mm wide and 300mm deep axially pre-stressed by a cable carrying an effective force of 180 kN. Total udl on beam is 5 kN/m (including dead load). Compare the magnitude of principal tension developed in the beam with and without axial prestress. **(08 Marks)**

OR

8 a. What are the different methods to improve the shear resistance of PSC beam? **(04 Marks)**

b. A prestressed concrete beam of unsymmetrical section is shown in Fig.Q8(b); the fibre stress distribution diagram 15 N/mm^2 at the top and zero at the bottom. Total vertical shear force is 2500 kN. Compute the principal tension at the centroidal axis at the support.

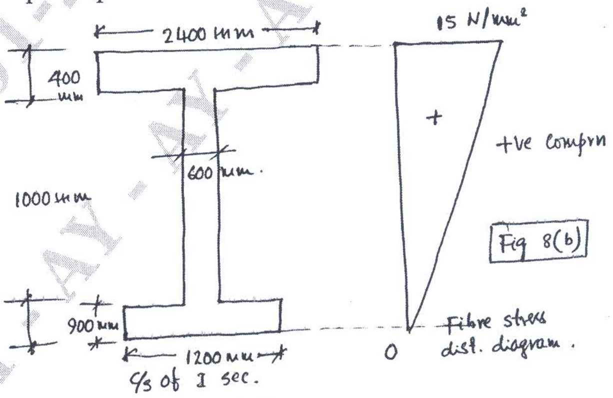

Fig.Q8(b) **(12 Marks)**

Module-5

9 a. Explain end block and anchorage zone stresses with types of reinforcement. **(08 Marks)**

b. The end block of a post-tensioned beam (300×300)mm in cross section subjected to concentric anchorage force 900 kN by a circular plate of area 15000 mm^2. Calculate bursting tension and design anchorage reinforcement, by IS-1343 code provision. **(08 Marks)**

OR

10 a. List the advantages of composite construction. **(02 Marks)**

b. A pre-cast pretensioned beam 150mm wide and 300mm is prestressed with initial prestressing force of 200 kN located at 50mm from the soffit. The beam is incorporated in composite section by casting a top flange 500mm × 100mm. The composite section supports a live load of 12 kN/m^2 over span of 6m. Calculate the resultant stress developed in beam and cast-in-situ slab. Take loss ratio (η) = 80%. Assume unpropped construction. Take density of concrete 24 kN/m^3. Draw the stress distribution diagrams. **(14 Marks)**

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