

R18

Code No: 156CN

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year II Semester Examinations, February/March - 2022

PRESTRESSED CONCRETE

(Civil Engineering)

Time: 3 hours

Max. Marks: 75

Answer any five questions
All questions carry equal marks

1.a) Distinguish between linear and circumferential prestressing.

b) Write about:

i) Permissible stress

ii) Relaxation of stress

iii) Stress corrosion

iv) Prestressed Concrete.

[7+8]

2. Explain about any three post tensioned anchorage systems.

[15]

3. A prestressed concrete pile 250 mm square, contains 60 pre-tensioned wires, each of 3mm diameter, uniformly distributed over the section. The wires are initially tensioned on the prestressing bed with a total force of 500 kN. Calculate the final stress in concrete and the percentage loss of stress in steel after all losses, given the following data:

$E_s = 210 \text{ kN/mm}^2$ and $E_c = 32 \text{ kN/mm}^2$

Shortening due to creep = 30×10^{-6} mm/mm per N/mm^2 of stress

Total shrinkage = 200×10^{-6} per unit length

Relaxation of steel stress = 5 per cent of initial stress

Prestressing force, $P = 400 \text{ kN}$

[15]

4. A prestressed concrete beam having unsymmetrical I-section has a fibre stress distribution of 13 N/mm^2 (compression) at the top edge linearly reducing to zero at the bottom. The top flange width and thickness are 2400 mm and 400 mm respectively. The bottom flange width and thickness are 1200 mm and 900 mm respectively and the depth and web thickness are 1000 mm and 600 mm respectively. The total shear force is 2350 kN. Compute and compare the principal stresses at the centroidal axis and the junction of web with lower flange.

[15]

5.a) Explain stress concept.

b) A prestressed concrete beam is of size 500 mm \times 900 mm. The beam is simply supported on a span of 8 m. It is subjected to a central concentrated load of 1500 kN. The beam carries a dead load of 10 kN/m. A bent tendon is provided at an eccentricity of 100 mm below the centroidal axis and 50 mm below the centroidal axis at the ends. Compute the extreme stresses at midspan of the beam.

[7+8]

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6. Explain in detail about the designing Type I and Type II PSC beams. [15]

AG 7. The end block of a post tensioned concrete beam $300\text{ mm} \times 300\text{ mm}$ is subjected to a concentric anchorage force of 800 kN by a freyssinet anchorage system of area 1100 mm^2 . Design, Discuss and detail the anchorage reinforcement for the end block. [15]

AG 8. A concrete beam having a rectangular section $100 \times 300\text{ mm}$ is prestressed by a parabolic cable with an initial prestressing force of 240 kN . The cable has an eccentricity of 50 mm at the centre and concentric at the supports. If the span of the beam is 10 m and subjected to a live load of 2 kN/m . Calculate the short-term deflection at midspan. Assume $E_c = 38\text{ kN/mm}^2$ creep coefficient = 2, loss of prestress = 20%. Estimate the long-term deflection. [15]

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