

**R18**

Code No: 156CN

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year II Semester Examinations, March - 2024

**PRESTRESSED CONCRETE**

(Civil Engineering)

Time: 3 Hours

Max. Marks: 75

- Note:** i) Question paper consists of Part A, Part B.  
ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.  
iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.  
iv) Use of only IS 1343 is allowed.

**PART – A**

**(25 Marks)**

- 1.a) Define prestressed Concrete. [2]
- b) What is the necessity of high strength concrete in prestressed concrete construction? [3]
- c) What are factors influencing the shrinkage loss? [2]
- d) What are the factors influencing the loss of stress due to creep of concrete? [3]
- e) What is a pressure line? [2]
- f) What is meant by Type – I, Type – II and Type – III structures in pre-stressed concrete? [3]
- g) What is the anchorage zone? [2]
- h) Explain the term busting tension with reference to post tensioned pre stressed members. [3]
- i) What is the main factor that influences the deflection of a prestressed concrete member? [2]
- j) Distinguish between propped and unpropped Construction. [3]

**PART – B**

**(50 Marks)**

- 2.a) Briefly explain the general principles of pre-tensioned and post-tensioned concrete structures.
- b) Explain the advantages of prestressed concrete over reinforced concrete construction. [5+5]

**OR**

- 3.a) State different types of prestressing with their important features.
- b) Distinguish between linear and circumferential prestressing. [5+5]
4. A pretensioned beam, 250mm wide and 350mm deep, is prestressed by 10 wires of 7mm diameter initially stressed to  $1200\text{N/mm}^2$ , with their centroids located 100mm from the soffit. Find the maximum stress in concrete immediately after transfer, allowing only for elastic shortening of concrete. If the concrete undergoes a further shortening due to creep and shrinkage while there is a relaxation of seven percent of steel stress, estimate the find percentage loss of stress in the wires using IS:1343 regulations, and by assuming  $E_s=210\text{KN/mm}^2$ ,  $E_c=35\text{KN/mm}^2$ , creep coefficient =1.6 and total residual shrinkage strain= $3\times 10^{-4}$ . [10]

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**OR**

5. A post tensioned concrete beam of 100 mm wide and 300mm deep spanning over 10m is stressed by successive tensioning and anchoring of three cables 1, 2 and 3 respectively. The cross sectional area of each cable is  $200\text{mm}^2$ , initial stress in the cable is  $1200\text{ N/mm}^2$  and  $m = 6$ . The first cable is parabolic with the eccentricity 50 mm below centroidal axis at the centre of span and the 50mm above the centroidal axis at support sections. The second cable is parabolic with zero eccentricity at the support and an eccentricity of 50mm at the centre of span. The third cable is straight with uniform eccentricity of 50mm below centroidal axis. Estimate the percentage loss of stress in each of the cables if they are successively tensioned and anchored. [10]

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6. The support section of a prestressed concrete beam 150mm wide and 300mm deep is required to support an ultimate shear force of 100 kN. The compressive prestress at the centroidal axis is  $5\text{ N/mm}^2$ . The characteristic cube strength of concrete is  $40\text{ N/mm}^2$ . The cover to the tension reinforcement is 30mm. If the characteristic tensile strength of stirrups is  $500\text{ N/mm}^2$ , design suitable shear reinforcements in the section using IS code recommendations. [10]

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**OR**

- 7.a) Explain the Factors influencing the shear strength of PSC members subjected to flexure.  
b) Design the shear reinforcement of a post-tensioned simply supported beam of cross-section  $230\text{ mm} \times 350\text{ mm}$  and span 15 m is subjected to uniformly distributed load of  $20\text{ kN/m}$  over its entire span. The compressive prestress at the centroidal axis is 6 MPa. Adopt M40 concrete and Fe500 steel for stirrups. [3+7]

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8. A PSC beam 300mm wide and 500mm deep has two anchorages of 150mm diameter with the center at 125mm from top and bottom of the beam. The force transmitted by each cable is 800kN. Estimate the maximum tension and bursting tension. [10]

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**OR**

- 9.a) Explain the necessity of anchorage zone reinforcement of PSC members.  
b) Explain the salient features of the Magnel's method of analysis of an end block. [5+5]

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- 10.a) Explain the structural behaviour of composite beams.  
b) Explain the behaviour of propped and unpropped composite constructions. [5+5]

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**OR**

11. A prestressed concrete beam has a symmetrical I – section with overall depth 320mm. Top and bottom flange width = 160mm. The flange thickness = 70mm. The web is 50mm in thickness and the span = 6m. It is prestressed with 182kN at a constant eccentricity of 105mm. Assume a loss of 15% in prestress. Compute the deflection due to a) Prestress + self-weight b) Prestress + self-weight + Live load of  $60\text{kN/m}$ . c)  $E_c = 38\text{kN/mm}^2$ . [3+4+3]

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