Code No : 20CE7P01 **R20**

IV B. TECH I SEMESTER REGULAR EXAMINATIONS, NOVEMBER - 2023
PRESTRESSED CONCRETE STRUCTURES
(CIVIL ENGINEERING)

Time: 3 hours Max. Marks: 70

Note : Answer **ONE** question from each unit **(5 × 14 = 70 Marks)**

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UNIT-I

1. a) What is the need for the use of high strength concrete and tensile steel in prestressed concrete? [7M]

   b) Distinguish between creep and shrinkage. What are the factors influencing the creep and shrinkage of concrete? [7M]

(OR)

2. a) What is the basic principle of prestressed concrete? Explain the application of prestressed concrete. [7M]

   b) What is meant by pre-tensioning? Discuss the advantages and disadvantages when pre-tensioning is done. [7M]

UNIT-II

3. a) Explain about Freyssinet and Magnel Blaton's anchorage systems [7M]

   b) A rectangular concrete beam of cross section 200mmX400mm deep is prestressed by 12 wires of 7mm diameter 30mm from top. The effective prestress in steel is 800N/mm^2. The beam has an effective span of 6 m and supports a super imposed load of 10kN/m. Locate the thrust line at quarter and mid span section. [7M]

(OR)

4. a) What is the difference between pre tensioning and post tensioning? [7M]

   b) A box girder of pre-stressed concrete bridge of span 40m has overall dimensions of 1200mm by 1800mm. The uniform thickness of walls 200mm. The live load analysis indicates a maximum live load moment of 2000 kN at centre of span. The beam is pre-stressed by parabolic cables with an effective force of 7000 kN. The cables which are concentric at supports have an eccentricity of 800mm at centre of span section. Compute the resultant stresses at centre of span section using the internal resisting couple method. [7M]

UNIT-III

5. a) Explain about any five losses of prestress. [7M]

   b) A concrete beam is post-tensioned by a cable carrying an initial stress of 1000 N/mm^2. The slip at the jacketing end was observed to be 5 mm. The modulus of elasticity of steel is 210 kN/mm^2. Estimate the percentage loss of stress due to anchorage slip if the length of the beam is (i) 30 m and (ii) 3 m. [7M]
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(OR)

6. A prestressed concrete beam, 200 mm wide and 300 mm deep, is prestressed with wires(area = 320 mm^2) located at a constant eccentricity of 50mm and carrying an initial stress of 1000 N/mm^2 .The span of the beam is 10m. calculate the percentage loss of stress in wires if (i) the beam is pretensioned and (ii) the beam is post tensioned using the following data: Es = 210kN/mm^2 and E_c = 35 kN/mm^2 , relaxation of steel stress = 5% of the initial stress, shrinkage of concrete = $300x10^{-6}$ for pre-tensioning and $200x10^{-6}$ for post tensioning, creep coefficient = 1.6, slip at anchorage = 1mm, frictional coefficient for wave effect = 0.0015 per m. [14M]

UNIT-IV

7. A pre-tensioned concrete beam of cross-section 175 mm x 300 mm is provided with an effective cover of 50 mm. If the cube strength of concrete is 35 N/mm^2 and tensile strength of steel is 1600 N/mm^2, and area of prestressing steel is 470 mm^2,determine the flexural strength of the double T-girder using IS: 1343 provisions. Sketch the details. [14M]

(OR)

8. The support section of a prestressed concrete beam, 100 mm wide by 250 mm deep, is required to support an ultimate shear force of 80 kN. The compressive prestress at the centroidal axis is 5 N/mm^2 . The characteristic cube strength of concrete is 40 N/mm^2 . The cover to the tension reinforcement is 50 mm. If the characteristic tensile strength of stirrups is 415 N/mm^2 , design suitable shear reinforcements in the section using IS code recommendations. [14M]

UNIT-V

9. A PSC beam of rectangular section 130mm x 325 mm spans over 6m. The beam is prestressed by straight cable with an effective force of 200 kN at an eccentricity of 50mm. E_c = 38 kN/mm^2. Compute the deflection at mid span [14M]
   (i) For prestress + self-weight.
   (ii) Find the magnitude of UDL which will nullify the deflection due to prestress and self-weight.

(OR)

10. a) Discuss the analysis of stresses at anchorage by Magnel's method. [7M]
    b) Discuss the analysis of anchorage stresses by Guyon's method. [7M]

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