

Code No: 156CN

**R18**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**B. Tech III Year II Semester Examinations, August - 2022**

**PRESTRESSED CONCRETE**

**(Civil Engineering)**

**Time: 3 Hours**

**Max.Marks:75**

**Answer any five questions**

**All questions carry equal marks**

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**Note: Use of only IS 1343 is allowed.**

1. Discuss in detail about pre-tensioning and Post tensioning and their advantages and limitations of Prestressed concrete. [15]
2. Explain about different methods of prestressing. Also explain about the necessity of high strength steel and concrete. [15]
3. Discuss about Gifford- Udall and Magnel post tensioned systems. [15]
- 4.a) Explain Loss due to elastic shortening in post tensioned pre-stressed concrete  
b) A concrete beam is pre-stressed by a cable carrying an initial pre-stressing force of 800kN. The cross-sectional area of the wires in the cable is 400 mm<sup>2</sup>. Calculate the percentage loss of stress in the cable only due to shrinkage of concrete using IS: 1343 recommendations assuming the beam to be, (i) pre-tensioned and (ii) post-tensioned. Assume  $E_s = 200$  Gpa and age of concrete at transfer = 28 days. [4+11]
5. The horizontal pre-stress at the centroid of a concrete beam of size 150mm×300mm is 8Mpa and the maximum shear force on the beam is 80kN, calculate the maximum principal tensile stress. What is the minimum vertical pre-stress required eliminating this principal tensile stress? [15]
6. A simply supported PSC beam of span 10m and cross section 500 mm × 750 mm. The beam is prestressed by a parabolic cable having eccentricity of 200 mm at the center and zero at the supports. The effective force in the cable is 1600 kN. If the beam supports a total UDL of 40 kN/m, including the self-weight, determine the extreme fiber stresses and force required in the cable having the same eccentricity to balance a total load of 50 kN/m on the beam. [15]
7. The end block of a post tensioned concrete beam 450mm × 450mm is subjected to a concentric anchorage force of 800kN by a Freyssinet anchorage system of area 1200mm<sup>2</sup>. Discuss and detail the anchorage reinforcement for the end block. [15]
8. The cross-sectional area of a concrete beam is  $32 \times 10^3$  mm<sup>2</sup> and the radius of gyration is 72mm is pre-stressed by a parabolic cable carrying an effective stress of 1200 N/mm. The span of the beam is 8m. The cable composed of 7 wires of 7mm diameter, has an eccentricity of 120mm at the centre and zero at the supports. Neglecting all losses, find the central deflection of the beam as follows:  
a) Self-weight + prestress  
b) Self-weight + prestress + live load of 2 kN/m. [7+8]

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