Code No: **RT41012** **R13** **Set No. 1**

IV B.Tech I Semester Supplementary Examinations, March – 2017

PRESTRESSED CONCRETE

(Civil Engineering)

Time: 3 hours **Max. Marks: 70**

Question paper consists of Part-A and Part-B

Answer ALL sub questions from Part-A

Answer any THREE questions from Part-B

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PART–A *(22 Marks)*

1. a) Discuss the load transfer mechanism in pre-tensioned and post-tensioned members [4]
   b) Explain the Type – **I**, Type – **II** and Type – **III** structures in pre-stressed concrete [3]
   c) Discuss the measures to be adopted for counteracting elastic loss and friction loss in case of post tensioned members. [4]
   d) A rectangular concrete beam of cross section 200mmX400mm deep is pre stressed by 12 wires of 7mm diameter 30mm from top. The effective pre stress 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. [4]
   e) Explain different types of shear failures in prestressed concrete beams [3]
   f) Draw a sketch showing the stress distribution in end block by double anchor plate [4]

PART–B *(3x16 = 48 Marks)*

2. a) What is Pre-stressing and explain different types of Prestressing [8]
   b) Discuss why high grade concrete and high strength steel are basic requirements for a PSC member. [8]

3. a) A rectangular concrete beam 100mm wide & 250mm deep spanning over 8m is prestressed by a straight cable carrying a effective prestressing force of 250Kn located at an eccentricity of 40mm. The beam supports a live load of 12 kN/m. Find the magnitude of prestressing force with an eccentricity of 40mm which can balance the stresses due to dead load & live load at the soffit of the centre span section. [8]
   b) Discuss about any 2 types of post tensioning anchorage systems with neat sketches. [8]

4. 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 prestresssing bed with a total force f_o 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 kN/mm^2 & E_c = 32 kN/mm^2
   Shortening due to creep = 30 x 10-6 mm/mm per N/mm^2 of stress
   Total shrinkage = 200 x 10^{-6} per unit length
   Relaxation of steel stress = 5 per cent of initial stress
   Prestressing force, P = 400 kN [16]

5. The floor slab of a industrial structure spanning over 15 m is to be designed as a one way pre stressed concrete slab with parallel post-tensioned cables. The slab is required to support a live load of 10kN/m^2 with the compressive and tensile stress in concrete at any stage not exceeding 14 and 2 N/mm^2 respectively. Design the suitable thickness for the slab and estimate the maximum horizontal spacing of Prestressing cables (12 of 5mm dia initially stressed to 1200N/mm^2) and their position at mid span section. Take loss ratio as 0.8. [16]

6. a) A post tensioned beam of 15m of rectangular cross section, 250 mm wide and 475 mm deep, is 10 m long and carries an applied load of 10kN/m.UDL on the beam. The effective prestressing force in the cable is 650 kN. The cable is Parabolic with zero eccentricity at the supports and a maximum eccentricity of 150 mm at the center of span. Calculate the principal stresses at the supports [8]

   b) The support section of a pre stressed concrete beam, 100mm wide and 250mm deep, is required to support an ultimate shear force of 80KN. The compressive prestress at the centroidal axis is 5 N/ mm^2. The cover to the tension reinforcement is 50 mm. if the characteristics tensile strength of steel in stirrups is 250N/mm^2, design suitable of steel in stirrups is 250 N/ mm^2 . [8]

7. The end block of a prestressed concrete beam, rectangular in section, is 120 mm wide and 300mm deep. The prestressing force of 250kN is transmitted to concrete by distribution plate, 120mm wide and 75mm deep, concentrically located at the ends. Calculate the position and magnitude of the maximum tensile stress on the horizontal section through the centre of the end block using the Guyon method. Yeild stress in steel = 250 N/mm^2 and design the end block also sketch the reinforcement in the designed block. [16]