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

IV B.Tech I Semester Supplementary Examinations, February/March - 2018

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 THEE questions from Part-B
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PART–A *(22 Marks)*

1. a) What is the need for the use of high strength concrete and tensile steel in prestressed concrete? [4]
   b) A rectangular concrete beam 100 mm wide & 250 mm deep spanning over 8m is prestressed by a straight cable carrying a effective pre stressing force of 250 kN located at an eccentricity of 40 mm. The beam supports a live load of 1.2 kN/m. Calculate the resultant stress distribution for the centre of the span cross section of the beam assuming the density of concrete as 24 kN/m^3. [4]
   c) Why loss due shrinkage is more for pre tensioned member compared to post tensioned member and describe about friction loss in a post tensioned member? [4]
   d) List the factors influencing the short term and long term deflections of prestressed concrete members. [4]
   e) Explain the ways by which shear resistance of structural concrete members can be improved. [3]
   f) Enumerate the requirements of end blocks in post-tentioned pre-stressed concrete element. [3]

PART–B *(3x16 = 48 Marks)*

2. a) Define Prestressed concrete and bring out the differences between RCC and PSC. [8]
   b) What are the design loads and material strength criteria concerning to limit state design? Explain. [8]

3. a) Show that a change in the external moment in the elastic range of a prestressed concrete beam results in a shift of the resultant thrust line rather than an increase in the resultant force in the beam. [8]
   b) Discuss about any two types of Post tensioning anchorage systems with neat sketch. [8]

4. A prestressed concrete pile 250 mm square, contains 60 pre-tensioned wires, each of 2mm diameter, uniformly distributed over the section. The wires are initially tensioned on the prestresssing bed with a total force f_o 300 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 = 300 kN [16]

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5. a) A PSC beam of 230 mm wide and 450 mm deep is used over an span of 4m is pre stressed by a cable carrying a force of 650 kN & located at an eccentricity of 75mm. The beam supports three concentrated loads of 25 kN at each quarter span points. Determine the location of the pressure line in beam at centre, quarter & support sections. Neglect the moment due to self weight of the beam. [8]

   b) A PSC beam of span 8m has the following data:
   Area $=32\times10^3$ mm^2, E=38 kN/m^2, width of gyration 72 mm
   Cable: parabolic, 6 wires of 7 mm HTS, concentric at supports and eccentric by 50mm at mid span. F_{pe}= 1000 N/mm^2
   Determine the deflection for the following cases:
   i) Self weight+ Prestress
   ii) Self weight +Prestress +Live load of 3 kN/m. [8]

6. A post tensioned beam of 15 m of rectangular cross section, 250 mm wide and 475 mm deep, is 10 m long and carries an applied load of 10 kN/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 (a) Calculate the principal stresses at the supports. (b) What will be the magnitude of the principal stresses at the supports in the absence of prestress? [16]

7. The end block of a post tensioned concrete beam 300 mm×300 mm is subjected to a concentric anchorage force of 800 kN by a freyssinet anchorage system of area 1100mm^2. Design, Discuss and detail the anchorage reinforcement for the end block. [16]