Code No: H8705/R13

M. Tech. II Semester Regular/ Supplementary Examinations, July-2016

PRE-STRESSED CONCRETE

(Common to SE and SD)

Time: 3 Hours **Max. Marks: 60**

Answer any FIVE Questions
All Questions Carry Equal Marks

1. a Explain with sketches ' Hoyer's long line system of pretensioning' 6
   b A rectangular beam of cross section 200mm x 300mm is pre-stressed by means of 15 wires of 5mm dia bars located 65mm from the soffit of the beam. And three wires of 5mm diameter is located 25mm from the top of the beam. By assuming the prestress in steel as 840N/mm^2 and length of beam as 6m calculate the stress at the extreme fibres of the mid span section if the beam is imposed with 6kN/m. 6

2. a A rectangular prestressed beam 150 mm wide and 300 mm deep is used over an effective span of 10 m. The cable with zero eccentricity at he supports, and linearly varying to 50 mm at the centre, carries and effective prestressing force of 500kN. Find the magnitude of the concentrated load Q located at the centre of the span for the following condition at the centre of span section: 6
      i. If the load counteracts the bending effect of the prestressing force (neglecting self-weight of beam?), and
      ii. If the pressure line passes through the upper kern of the section under the action of the external load, self-weight and prestress.
   b The cross-section of a pre-stressed concrete beam used over a span of 6 m is 100 mm wide and 300mm deep. The initial stress in the tendons located at a constant eccentricity of 50 mm is 1000N/mm^2. The sectional area of the tendons is 100mm ^{2}. Find the percentage increase in stress in the wires when the beam supports a live load of 4kN/m. The density of concrete is 24kN/m^3. Modulus of elasticity of concrete = 36kN/mm^2. Modulus of elasticity of steel = 210kN/mm^2. 6

3. a What is anchorage slip? How do you compute the loss of stress due to anchorage slip? 4
   b A prestressed concrete pile, 250 mm square, contains 60 pre-tensioned wires, each of 2 mm diameter, uniformly distributed over the section. The wires are initially tensioned on the prestressing bed with a total force of 300 kN. Calculate the final stress in concrete and the percentage loss of stress is steel after all losses, give the following data: 8
   E_s = 210 kN/mm^2
   E_c = 32 kN/mm^2
   Shortening due to creep = 30 x10^{-6} mm/mm per N/mm^2
   Total shrinkage = 200 x10^{-6} per unit length
   Relaxation of steel stress = 5 per-cent of initial stress
   Prestressing force, P = 300 kN

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4. a What are the different types of flexural failure modes observed in prestressed concrete beams? Explain with neat an sketches. 6
   b The cross-section of a prestressed concrete beam is rectangular with a width of 350 mm and an overall depth of 700 mm. the prestressing force of 180 kN acts an eccentricity of 190 mm. if the bending and twisting moments at the section are 80 and 20 kN m respectively, calculate the maximum principal tensile stress at the section. 6
   In beam subjected to combined torsion and bending, the middle of the bottom face is the critical point where the principal tension is maximum.

5. a Discuss in detail about the shear and principal stresses with an neat sketch. 4
   b The horizontal prestress at the centroid of a concrete beam of rectangular cross section 120mm x 250mm, is 7 N/mm^2 and the maximum shearing on the beam is 70 kN. Calculated the maximum principal tensile stress, what is the minimum vertical prestress required to eliminate this principal tensile stress? 8

6. a What is the advantage of using composite construction with prestressed and in situ concrete in structural members? 6
   b Discuss in detail about the Linear transformation and Concordant tendons with an neat sketches. 6

7. a Distinguish clearly between short term and long term deflection of prestressed concrete beams. 4
   b A composite T-beam up of a per-tensioned rib 100 mm wide and 200 mm deep, and a cast in situ slab 400 mm wide and 40 mm thick having a modulus of elasticity of 28 kN/mm^2. If the differential shrinkage is 100 $x10^{-6}$ units, determine the shrinkage stresses developed in the precast and cast in situ unit. 8

8. a What are the various methods generally used for the investigation of anchorage zone stressed? 4
   b Using Guyons method, compute the position and magnitude of maximum tensile stress and bursting tension for the end block of 100mm wide and 200mm deep with the concentric anchor force 100kN is transmitted to concrete by a distribution plate 100mm wide and 50mm deep, concentrically located at the ends. 8

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