R09

Code No: D2005

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH II - SEMESTER EXAMINATIONS, APRIL/MAY 2012
PRE STRESSED CONCRETE
(STRUCTURAL ENGINEERING)

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

Answer any five questions
All questions carry equal marks

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1. A pretensioned beam 250mm wide and 300mm deep is prestressed by 12 wires each of 7mm diameter initially stresses to 1200N/mm^2 with their centroids located 100mm from the soffit. Estimate the final percentage loss of stress due to elastic deformation, creep, shrinkage and relaxation using IS:1343-80 code and the following data:
   Relaxation of steel stress = 90N/mm^2
   E_s=210kN/mm^2 E_c=35kN/mm^2
   Creep coefficient (Φ) = 1.6
   Residual shrinkage strain = 3×10^{-4}

2.a) How do you compute the loss of stress in steel due to curvature and wobble effect?
   b) What is anchorage slip? How do you compute the loss of stress due to anchorage slip?
   c) What are the factors influencing the loss of stress due to creep of concrete?

3. An unsymmetrical I-section has an overall depth of 200mm. The top flange width and depth are equal to 1200 and 300mm respectively, and the bottom flange width and depth are equal to 750 and 200mm respectively. The thickness of the web is 300mm. The tendons having a cross-sectional area of 7000 mm^2 are located 200mm from the soffit. If the ultimate compressive strength of concrete and the tensile strength of steel are 42 and 1750 N/mm^2 respectively and the tendons are effectively bonded to concrete, estimate the flexural strength of the section. (Adopt IS:1343 provisions).

4.a) A concrete beam is prestressed by a parabolic cable having an eccentricity of e_1 towards the soffit at centre of span and an eccentricity of e_2 towards the top near support sections. Find the ratio these eccentricities for zero deflection at the centre of span due to prestress only.
   b) Outline the various factors influencing the effective moment of inertia of cracked concrete sections.

5.a) Outline the factors influencing the ultimate shear resistance of prestressed concrete sections with flexure-shear cracks.
   b) Discuss the various methods of predicting long-term deflection of uncracked prestressed concrete members.

6. A pretensioned beam of rectangular section, 200mm wide by 450mm deep, is prestressed by 10 wires of 5mm diameter located at an effective eccentricity of 150mm. The maximum shear force at a particular section is 120kN. If the modular ratio is 6, calculate the flexural bond stress developed assuming
   a) The section as uncracked,
   b) The section as cracked.

7.a) What are the various methods generally used for the investigation of anchorage zone stresses?

b) The end block of a post-tensioned prestressed concrete beam, 300mm wide and 300mm deep, is subjected to a concentric anchorage force of 832800 N by a Freyssinet anchorage of area 11720mm^2. Design and detail the anchorage reinforcements for the end block.

8. An two-span continuous prestressed concrete beam ABC (AB=BC=15m) has a uniform cross-section with a width of 250mm and depth of 600mm. A cable carrying an effective prestressing force of 500kN is parallel to the axis of the beam and located at an eccentricity of 200mm.
   a) Determine the secondary and resultant moment developed at the mid-support section B.
   b) If the beam supports an imposed load of 2.4kN/m, calculate the resultant stress developed at the top and bottom of the beam at B. Also locate the resultant line of thrust through the beam AB.

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