Code No: I3507/R16

M. Tech. I Semester Regular Examinations, January-2017

PRESTRESSED CONCRETE STRUCTURES

[Computer Aided Structural Engineering (35)]

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

Answer any FIVE Questions
All Questions Carry Equal Marks

1. a Distinguish between the terms 6m
   i) Uniaxial
   ii) Biaxial and
   iii) Triaxial prestressing.
   b Distinguish between concentric and eccentric tendons, indicating their practical applications. 6m

2. a A prestressed concrete pile of cross section, 250 mm x 252 mm, contains 60 pretensioned wires, each of 2 mm diameter, distributed uniformly over the section. The wires are initially tensioned on the prestressing bed with a total force of 300 kN. If E_s = 210 kN/mm^2 and E_c =32 kN/mm^2, calculate the respective stresses in steel and concrete immediately after the transfer of prestress, assuming that up to this point the only loss of stress is that due to elastic shortening. 8m
   b List the various types of loss of prestress in pretensioned and post-tensioned members. 4m

3. a What are the different types of flexural failure modes observed in prestressed concrete beams? Explain with sketches. 6m
   b The cross section of a symmetrical I-section prestressed beam is 300mm by 750mm (overall), with flanges and web 100 mm thick. The beam is post-tensioned by cables containing 48 wires of 5 mm diameter high-tensile steel wires at an eccentricity of 250 mm. The 28-day strength of concrete in compression is 40 N/mm^2 and the ultimate tensile strength of wires is 1700 N/mm^2. Assuming that the grouting of the tendons is 100 per cent effective, determine the ultimate moment of the section. 6m

4. A prestress concrete beam spanning over 8 m is of rectangular section, 150 mm wide and 300 mm deep. The beam is prestressed by a parabolic cable having an eccentricity of 75 mm below the centroidal axis at the centre of span and an eccentricity of 25 mm above the centroidal axis at the support sections. The initial force in the cable is 350 kN. The beam supports three concentrated loads of 10 kN each at intervals of 2 m. E_c =38 kN/mm^2. 12m
   i. Neglecting losses of prestress, estimate the short-term deflection due to (prestress+ self-weight); and.
   ii. Allowing for 20 per cent loss in prestressm estimate the long term deflection under (prestress + self-weight + live load), assuming creep coefficient as 1.80.

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5.		Analyze the end block by Guyon's method.	12m
6.	a	What is 'Pressure or Thrust line'? Explain its significance with sketches.	6m
	b	What are the advantages of using composite construction with prestressed and insitu concrete in structural members?	6m
7.		The cross section of a prestressed concrete beam used over a span of 6 m is 100 mm wide and 300 mm deep. The initial stress in the tendons located at a constant eccentricity of 50 mm is 1000 N/mm^2. The sectional area of the tendons is 100 mm^2. Find the percentage increase in stress in the wires when the beam supports a live load of 4 kN/m. The density of concrete is 24 kN/m^3.	12m
8.	a	How do you compute the loss of stress due to shrinkage of concrete as per IS:1343 code recommendations?	6m
	b	Discuss the various methods of predicting long-term deflections of uncracked prestressed concrete members.	6m

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