Code: R7 420105

R7

B.Tech IV Year II Semester (R07) Advanced Supplementary Examinations, June 2012

PRESTRESSED CONCRETE

(Civil Engineering)

Time: 3 hours Max Marks: 80

Answer any FIVE questions

All questions carry equal marks

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1 (a) Explain the general principles of pre tensioning and post tensioning.

(b) Write down the advantages and limitations of prestressed concrete.

2 Discuss different types of prestressing systems with neat sketches.

3 A prestressed concrete beam, 200 mm wide and 300 mm deep is prestressed with wires (A = 320 mm^2) located at a constant eccentricity of 50 mm and carrying an initial stress of 1000 N/mm^2. The span of the beam is 8 m. Calculate the % of stress in wires if (i) The beam in pre tensioned. (ii) The beam is post tensioned. Using the following data: E_S = 210 kN/mm^2, E_C = 35 kN/mm^2, creep coefficient = 1.6, shrinkage of concrete = 0.0003 forpre tensioning and 0.0002 for post tensioning and relaxation of steel stress = 5% of initial stress, frictional coefficient for wave effect = 0.0015/m, slip at an anchorage = 1 mm.

4 (a) Write down the assumptions made in the analysis of prestressing.

(b) A pretensioned concrete member has a section 200 mm×300 mm and is 5 m long. It is prestressed with 500 mm^2 of high tensile steel at 100 mm above the bottom fibre. The steel is stressed to a level of 1050 N/mm^2. Assuming m = 6, compute the stresses in concrete just after transfer.

5 A prestressed concrete beam, 80 mm wide and 120 mm deep is to be designed to support working loads of 4 kN each concentrated at third points over a span of 3 m. If the permissible stress in tension are zero at transfer and 1.4 N/mm^2 under working loads, design the number of 3 mm wires and corresponding eccentricity required at mid span section. Permissible stress in wires is 1400 N/mm^2. The loss of prestress is 20% and density of concrete is 24 kN/m^3.

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6 The end block of a post –tensioned member is 550 mm wide and 550 mm deep. Four cables, each made of 7 wires of 12 mm diameter strands and carrying a force of 1000 kN are anchored by plate anchorages, 150 mm by 150 mm, located with their centre at 125 mm from the edges of end block. The cable duct is 50 mm diameter. The cube strength of concrete at 28 days is 45 N/mm^2. The cube strength of concrete at transfer is 25 N/mm^2 permissible bearing stress behind anchorage should confirm with IS: 1343. The characteristic yield stress in mild steel anchorage reinforcement is 260 N/mm^2. Design suitable anchorages for end block.

7 A composite T beam is made up of a pretensioned rib 100 mm wide and 300 mm deep and cast in situ slab of 400 mm wide and 40 mm thickness. The modulus of elasticity of cast in situ slab will be 28 kN/mm^2. If the differential shrinkage is 0.0001. Determine the shrinkage stresses developed in the precast and cast in-situ units.

8 A prestressed 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 eccentricity 75 mm below the centroidal axis at centre of span. And eccentricity is 25 mm above centroidal axis at support sections. The initial force in cable is 350 kN. The beam supports three concentrated loads of 10 kN each at interval of 2 m. If the modulus of elasticity of concrete is 38 kN/mm^2, estimate the short time deflection due to self weight + prestress and allowing for 20% loss in prestress, estimate long term deflection under prestress + self weight + live load. Assume the creep coefficient to be 1.80.

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