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10CV74

Seventh Semester B.E. Degree Examination, June/July 2018
Design of Prestressed Concrete Structures

Time: 3 hrs. Max. Marks:100

Note: *1. Answer any FIVE full questions, selecting atleast TWO questions from each part.*
2. Use of IS1343 code is permitted.

PART – A

1 a. What is the necessity of using high strength concrete in P.S.C. work? **(06 Marks)**
b. What is the necessity of using high strength steel in P.S.C. construction? **(04 Marks)**
c. List the advantages and disadvantages of prestressed concrete over reinforced cement concrete. **(10 Marks)**

2 A prestressed concrete T-beam is to be designed to support a superimposed load of 4.4 kN/m over a span of 5 m. The 'T' beam is made up of a flange 400 mm 40 mm thick. The rib is 100 mm wide and 200 mm deep. The stress in concrete must not exceed 15 N/mm^2 at the bottom fibre and zero at the top fibre, due to self weight and prestressing force. Evaluate the prestressing force and it's eccentricity. Evaluate the resulting stresses after L.L is applied. Assume the density of concrete is 24 kN/m^3 and the loss of prestress at 20%. **(20 Marks)**

3 a. List the various losses of prestress in tensioned steel. **(03 Marks)**
b. A post tensioned concrete beam 100 mm wide and 300 mm deep, spanning over 10 m is stresses by **(17 Marks)**

4 a. Discuss the various factors affecting deflections in P.S.C. beams. **(06 Marks)**
b. The beam of uniform section is prestressed with a bent cable as shown below Fig.Q4(b), in which the initial prestress is 300 kN. Taking the loss ratio as 80%. Determine
(i) Maximum deflection at transfer of prestress
(ii) Maximum deflection at working load 8 kN/m. Assume M_{40} concrete. **(14 Marks)**

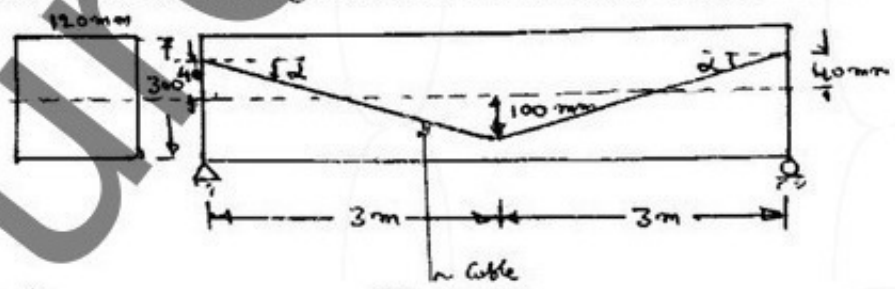

Fig.Q4(b)

PART – B

5 a. What are the different types of failure observed in a prestressed concrete beam? Explain with sketches. **(08 Marks)**
b. A post tensioned bridge girder with unbounded tendons is of base section of overall dimensions 1200 mm wide by 1800 mm deep with wall thickness of 150 mm. The high tensile steel has an area of 4000 mm^2 and its located at an effective depth of 1600 mm. The effective prestress in steel after losses is 1000 N/mm^2, and the effective span of the girder is 24 m. If f_{ck} = 40 N/mm^2 and f_p = 1600 N/mm^2. Estimate the ultimate flexural strength of the section. **(12 Marks)**

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6 a. Discuss briefly the modes of failure due to shear. **(04 Marks)**

b. List the methods of improving resistance in P.S.C beams. **(02 Marks)**

c. A simply supported beam of span 6 m is 120 × 300 mm in section. It is prestressed with a parabolic cable which carries an effective prestress of 200 kN. The cable has a maximum eccentricity of 100 mm at mid span section and minimum eccentricity of 50 mm at the support section. Determine the principal tension at 20 mm above the centroidal fibre in a section which lies at 0.6 m from the left support. The beam carries an all inclusive load of 15 kN/m. **(14 Marks)**

7 a. Explain the stress distribution in end block of a post tensioned prestressed concrete member with neat sketch. **(06 Marks)**

b. The end block of a prestressed concrete girder is 200 mm wide by 300 deep. The beam is post tensioned by two Freyssinet anchorages each of 100 mm diameter with their centres located at 75 mm from the top and bottom of the beam. The force transmitted by each anchorage being 2000 kN. Compute the bursting force and design suitable reinforcements according to Indian standard IS1343 code provisions. Sketch the arrangement of anchorage zone reinforcement. **(14 Marks)**

8 A post tensioned prestressed concrete beam of rectangular section 300 mm wide is to be designed to resist a live load moment of 360 kN-m on a span of 12m. Assuming 10% less and limiting tensile and compressive stress to 1.5 N/mm^2 and 18 N/mm^2 respectively. Calculate the minimum possible depth and the prestressing force and corresponding eccentricity. Take density of concrete as 24 kN/m^3. **(20 Marks)**

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