Code: 13A01805

R13

B.Tech IV Year II Semester (R13) Regular Examinations April 2017

PRESTRESSED CONCRETE

(Civil Engineering)

Use of IS code 1343:2012 is permitted in the examination hall

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) What is the grade of concrete used for post tensioned concrete members?

(b) Differentiate circular prestressing from linear prestressing.

(c) What shall be the eccentricity of a cable carrying a prestressing force of 500 kN at mid span of a rectangular PSC beam of size 400 mm x 800 mm, used for a span of 10 m, making the resultant top fiber stress zero at mid span, for dead load condition. Dead weight of concrete is 24 kN/m^3.

(d) What is creep coefficient? How do you estimate the loss of prestress due to creep of concrete using creep coefficient method?

(e) What is cracking moment? On what factors does it depend?

(f) Explain why a PSC beam with curved tendon resist shear better than the same with linear tendon?

(g) Differentiate web shear from flexure-shear.

(h) What is vertical prestressing?

(i) What is the effect of differential shrinkage in composite construction of PSC?

(j) Mention any two methods to control deflection of PSC members.

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 (a) List out the advantages and limitations of prestressed concrete.

(b) Why high strength materials are used in prestressed concrete construction?

OR

3 Explain the following systems of prestressing with the help of neat sketches:

(a) Fressynet system.

(b) Hoyer system.

UNIT – II

4 What are different losses in prestress? Give a detailed explanation of each for pre-tensioning and post-tensioning.

OR

5 A prestressed concrete beam, 200 mm wide and 300 mm deep, is prestressed with wires (area = 400 mm^2) located a constant eccentricity 50 mm and carrying an initial stress of 800 N/mm^2. The span of the beam is 10 m. Calculate the percentage loss of stress in wires as per IS 1343-2012 code if:

(a) The beam is pre-tensioned.

(b) The beam is post-tensioned, using the following data: E_S = 210 kN/mm^2 and E_C = 35 kN/mm^2, Age of concrete at transfer 7 days. Loss due to relaxation of steel is 5% of initial stress.

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UNIT – III

6 An unsymmetrical I-section beam is used to support an imposed load of 2 kN/m over a span of 8 m. The sectional details are top flange 300 mm wide and 60 mm thick; overall depth of the beam = 400 mm. At the centre of the span, the effective prestressing force of 100 kN is located at 50 mm from the soffit of the beam. Estimate the stresses at the centre of span section of the beam for the following load conditions.

(a) Prestress + self-weight.

(b) Prestress + self-weight + live load.

OR

7 A simply supported prestressed concrete beam spanning over 10 m is of rectangular section 500 mm wide by 750 mm deep. The force in the cable is 1600 kN. If the beam supports a total uniformly distributed load of 40 kN/m, which includes the self-weight, evaluate the cable zone limits at the support and quarter span of the beam for the following allowable stresses. $f_{cw} = f_{ct} = 12.5$ MPa; $f_{tt} = f_{bw} = -1.0$ MPa. Loss of prestress 15%.

UNIT – IV

8 A PSC beam of rectangular section 200 mm wide and 600 mm deep is prestressed by a parabolic cable located at an eccentricity of 100 mm at mid span and zero at the supports. If the beam has a span of 10 m and carries a uniformly distributed live load of 8 kN/m, design the shear reinforcement at the supports and quarter span section.

OR

9 Design a pre-cast prestressed inverted T-section to be used in a composite slab of total depth 600 mm and width 300 mm. The composite slab is required to support an imposed load of 16 kN/m^2 over a span of 14 m. The compressive stress in concrete at transfer and tensile stress under working loads may be assumed to be 20 MPa and 1 MPa. The loss ratio is 0.8. Determine the prestressing force required for the section.

UNIT – V

10 A prestressed concrete beam having a cross sectional area of 5×10^4 mm^2 is simply supported over a span of 10 m. It supports a uniformly distributed load of 3 kN/m, half of which is non permanent. The tendon follows a trapezoidal profile with an eccentricity of 100 mm within the middle third of the span and varies linearity from the third span point to zero at the supports. The area of tendons is $A_P = 350$ mm^2 have an effective prestress of 1290 MPa immediately after transfer. Using the following data calculate short term deflection. $I_g = 4.5 \times 10^8$ mm^4, $E_c = 34$ GPa, $E_s = 200$ GPa. Density of concrete 24 kN/m^3.

OR

11 List out the factors and explain them in detailed different parameters that influence the long term and short term deflections of a PSC member subjected to flexure.

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