Code: 13A01805 **R13**

B.Tech IV Year II Semester (R13) Advanced Supplementary Examinations July 2018

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 a pre-tensioned member?
(b) What are the advantages of pre-stressed concrete?
(c) What is loss of pre-stress?
(d) What do you understand by frictional losses?
(e) Discuss about the cable profile in PSC members.
(f) Illustrate Kern lines.
(g) Explain composite section.
(h) Illustrate principal stresses.
(i) Explain short term deflection of un cracked members of PSC.
(j) How do you control the deflection of PSC members?

PART – B

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

UNIT – I

2 (a) Discuss about the pre-stressing by different tendons in PSC members.
(b) Discuss about the characteristics of high strength tensile steel used in PSC.

OR

3 (a) Differentiate pre-tensioning and post-tensioning methods of PSC.
(b) Discuss in detail about the advantages and disadvantages of PSC.

UNIT – II

4 (a) Discuss about the loss of pre-stress due to bending of the member.
(b) A post tensioned PSC beam of 100 x 300 mm size is stressed by a parabolic cable with zero eccentricity at the supports and 50 mm at centre of the span. The area of the cable is 200 mm^2 and initial stress in the cable is 1200 N/mm^2. If the modulus of elasticity of steel is 210 kN/mm^2 and ultimate creep strain is 30 x 10^{-6} per N/mm^2 of stress, compute the loss of stress in steel only due to creep of concrete.

OR

5 (a) Discuss about the loss of pre-stress due to elastic shortening of concrete.
(b) A PSC beam of 150 x 300 mm size is pre-stressed by 8 high tensile wires of 7 mm diameter located at 100 mm from the soffit of beam. If the wires are tensioned to a stress of 1100 N/mm^2 compute the percentage loss of stress due to elastic deformation assuming modulus of elasticity of concrete and steel as 31.5 and 210 kN/mm^2.

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UNIT – III

6 (a) Write a short note on allowable stresses in design of PSC section for flexure.

(b) A pre-stressed beam has a symmetrical I-section in which the depth of each flange is one-fifth of overall depth and the web is thin enough to be neglected in bending calculations. At the point of maximum bending moment, the pre-stressing force is located at the centre of the bottom flange and the total loss of pre-stress is 20%. If there is to be no tensile stress in the concrete at any time, show that the dead load must be at least one-seventh of live load.

OR

7 Two simply supported beams AB = BC = 10 m of rectangular cross section each post tensioned by means of two parabolic cables (P = 300 kN each) with eccentricities of zero at the supports and 150 mm at mid span are converted into a continuous beam by tensioning a parabolic cap cable carrying a force of 300 kN. The ends of the cap cable are located at 3 m from the central support. The cable centre is 50 mm from top of the beam over the central support B. The beam is 200 mm wide and 600 mm deep.

(i) Compute the secondary moment induced at B.

(ii) Locate the resultant line of thrust through the beam AB.

(iii) Evaluate the resultant pre-stress along the top and bottom of the beam.

UNIT – IV

8 (a) Discuss about the shear and principal stresses in PSC members.

(b) A pre-stressed girder of 150 x 300 mm size is to be designed to support an ultimate shear of 130 kN. The uniform pre-stress across the section is 5 N/mm^2. Design suitable spacing for stirrups by using 8 mm diameter Fe415 grade steel and M40 grade of concrete.

OR

9 Discuss in detail about the general design considerations in respect of composite section of PSC.

UNIT – V

10 (a) Write a short note on load-deflection curve for PSC members.

(b) A PSC beam of 6 m span and 150 x 300 mm in size is pre-stressed by a straight cable carrying an effective force of 220 kN at an eccentricity of 50 mm. If the modulus of elasticity of concrete is 38 kN/m^2, compute the deflection at centre of the span due to pre-stress and self-weight and find the magnitude of uniformly distributed live load which will nullify deflection due to pre-stress and self weight.

OR

11 (a) List the various factors influencing the deflection of PSC members.

(b) A PSC beam of 8 m span and 150 x 350 mm in size is pre-stressed by a parabolic cable having an eccentricity of 75 mm below the centroidal axis at centre of span and 25 mm above the centroidal axis at support sections. The initial force in the cable is 300 kN and E_C = 38 kN/mm^2, if the beam supports 3 concentrated loads of 11 kN each at intervals of 2 m, estimate the long-term deflection under (pre-stress + self-weight + live load) by assuming creep coefficient as 1.80 and by allowing for 20% loss in pre-stress.

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