Roll No .....

CE-8045

B.E. VIII Semester

Examination, June 2015

Design of Prestressed Concrete Structures

(Elective-II)

Time : Three Hours

Maximum Marks : 70

Note: i) Attempt five questions.
ii) All questions carry equal marks.
iii) Assume suitable data if required.

1. a) Explain with sketches Hoyer's long line system of pretensioning.
   b) Explain the principle of post tensioning.

Or

2. A prestressed concrete beam of section 200 mm wide by 300 mm deep is used over an effective span of 8 m to support an imposed load of 5kN/m. The density of concrete is 24 kN/m^3. At the centre of span section of the beam, find the magnitude of
   a) The concentric prestressing force necessary for zero fibre-stress at the soffit when the beam is fully loaded.
   b) The eccentric prestressing force located 100 mm from the bottom of the beam which would nullify the bottom fibre stresses due to loading.

3. List the various types of loss of prestress. Explain them in detail.

Or

4. A Post-tensioned concrete beam of rectangular section, 100 mm wide and 300 mm deep, is stressed by a parabolic cable with zero eccentricity at the supports and an eccentricity of 50 mm at the centre of span. The area of the cable is 250 mm^2 and initial stress in the cable is 1200 MPa. If the ultimate creep strain is 30×10^{-6} mm/mm per N/mm^2 of stress and modulus of elasticity of steel is 210×10^3 N/mm^2. Compute the loss of stress in steel only due to creep of concrete.

5. a) List the various factors influencing the deflections of prestressed concrete members.
   b) A pretensioned T - section has a flange which is 300 mm wide 200 mm thick. The rib is 150 mm wide by 350 mm deep. The effective depth of the cross section is 500 mm. Given Ap = 200 mm^2; fck = 50 MPa and fp = 1600 MPa, estimate the ultimate moment capacity of the T - section using the Indian standard code.

Or

6. The support section of a prestressed concrete beam, 100 mm wide and 250 mm deep, is required to support an ultimate shear force of 60 kN. The compressive prestress at the centroidal axis is 5 N/mm^2. The characteristics cube strength of concrete is 40 MPa. The cover to the tension reinforcements is 50 mm. If the characteristic tensile strength of steel in stirrups is 230 MPa, design suitable reinforcements at the section.

7. Briefly outline the magnet's method of computing the horizontal and transverse stresses in end blocks subjected to concentrated force .

Or

8. Explain the mechanism by which prestressing force is transferred to concrete in pretensioned and post tensioned members.

9. A post-tensioned prestressed beam of rectangular section 250 mm wide is to be designed for an imposed load of 10 kN/m. Uniformly distributed on a span of 12 m. The stress in concrete must not exceed 17 MPa in compression or 1.4 MPa in tension at any time and the loss of prestress may be assumed to be 15%. Calculate:
   i) The minimum possible depth of the beam and
   ii) For the section provided, the minimum prestressing force and the corresponding eccentricity.

Or

10. Two simply supported beams, AB = BC = 10 m, of rectangular cross -sections, 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 continues 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 the top of the beam over the central support B. The beam is 200 mm wide and 600 mm deep:
    i) Calculate the secondary moment induced at B.
    ii) Locate the resultant line of thrust through the beam AB
    iii) Evaluate the resultant prestress along the top and bottom of the beam.

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