B.Tech IV Year II Semester (R09) Advanced Supplementary Examinations June/July 2016

PRESTRESSED CONCRETE

(Civil Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks
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1 Explain the advantages of prestressed concrete members over reinforced concrete members. Differentiate between pre tensioning and post tensioning systems.

2 Explain Freyssinet system & Lee Mccall system with the help of neat sketches.

3 A straight post tensioned concrete member 18 meters long with a cross section of 425 mm x 425 mm is prestressed with 920 mm^2 of steel wires. This steel is made up of four tendons with 230 mm^2 per tendon. The tendons are tensioned to a stress of 1025 N/mm^2. Determine the loss of prestress in each tendon due to elastic shortening of concrete. Find also the average percentage loss of prestress. If it is desired that after the last tendon is tightened, to a stress of 1025 N/mm^2, be maintained in each tendon, calculate the actual stresses to which the individual tendons should be tightened. Take m = 6.

4 A concrete beam of symmetrical I – section spanning 8 meters has a flange width and thickness of 200 and 60 mm respectively. The overall depth of the beam is 400 mm. The thickness of the web is 80 mm. The beam is prestressed by a parabolic cable with an eccentricity of 150 mm at the centre and zero at the supports with an effective force of 100 kN. The live load on the beam is 2 kN/m. Draw the stress distribution diagram at the central section for:

(a) Prestress + self weight (density of concrete = 24 kN/m^3).
(b) Prestress + self weight + live load.

5 A prestressed concrete beam of rectangular section 500 x 750 mm deep is provided with an inclined tendon with an upward eccentricity of 60 mm above the centroidal axis at the supports and an eccentricity of 125 mm below at the centre of the span. The beam carries a point load of 200 kN at the centre. The dead load on the beam being 9 kN/m, determine the stress distribution for the mid span section of the beam using all the three method of analysis: (a) Stress concept method. (b) Strength concept method. (c) Load balancing method.

6 A post tensioned beam of rectangular cross section, 200 mm wide and 400 mm deep, is 10 m long and carries an applied load of 8 kN/m, uniformly distributed on the beam. The effective prestressing force in the cable is 500 kN. The cable is parabolic with zero eccentricity at the supports and a maximum eccentricity of 140 mm at the centre of span.

(a) Calculate the principal stresses at the supports.
(b) What will be the magnitude of the principal stresses at the supports in the absence of prestress?

7 A composite T-beam is made up of a pre tensioned rib of 100 mm wide and 200 mm deep, and a cast in situ slab of 400 mm wide and 40 mm thick having a modulus of elasticity of 28 kN/mm^2. If the differential shrinkage is 100 x 10^{-6} units, determine the shrinkage stresses developed in the precast and cast in situ units.

8 A concrete beam having a rectangular section 100 mm wide and 300 mm deep is prestressed by a parabolic cable carrying an initial force of 240 kN. The cable has an eccentricity of 50 mm at the centre of span and is concentric at the supports. If the span of the beam is 10 m and the live load is 2 kN/m, estimate the short term deflection at the centre of span.
Assuming E = 38 kN/mm^2 and creep coefficient $\phi = 2.0$, loss of prestress = 20% of the initial stress after 6 months. Estimate the long term deflection at the centre of span at this stage, assuming that the dead and live loads are simultaneously applied after the release of prestress.

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