Code: R7420105

**R7**

B.Tech IV Year II Semester (R07) Supplementary Examinations, March/April 2013

**PRESTRESSED CONCRETE**

(Civil Engineering)

Time: 3 hours Max Marks: 80

Answer any FIVE questions

All questions carry equal marks

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1 (a) Explain the necessity of using high strength steel and high strength concrete in prestressed concrete.

(b) What are the advantages of prestressed concrete members over R.C.C members?

2 (a) Explain with the help of neat sketch Gifford Udall system.

(b) What are the various losses at prestressing? Explain in detail any two of them.

3 A pre tensioned beam 250 mm wide and 300 mm deep is prestressed by 12 wires each of 7 mm diameter initially stressed to 1200 N/mm$^2$ with their centroids located at 100 mm from the soffit. Estimate the final percentage loss of stress due to elastic deformation, creep, shrinkage and relaxation using IS:1343-80 code and the following data: Relaxation of steel stress = 90 N/mm$^2$; $E_S$ = 210 kN/mm$^2$ and $E_C$ = 35 kN/mm$^2$.

Creep coefficient (Ø) = 1.6; Residual shrinkage strain = $3 \times 10^{-4}$.

4 A prestressed concrete beam 400 mm wide and 600 mm deep has a span of 6 m. The beam is prestressed with a bent tendon having an eccentricity of 40 mm at the centre and zero eccentricity at the supports. The external load on the beam consists of a concentrated load of 180 kN at the mid span. If the effective prestressing force is 1200 kN, calculate the extreme stresses for the mid span section using:

(a) Stress concept method.

(b) Strength concept method.

(c) Load balancing method. Take the density of concrete as 25 kN/m$^3$.

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5 A most tensioned concrete beam of rectangular section 300 mm wide and 500 mm deep has a span of 12 m and carries a super imposed load of 9 kN/m, the tendon is provided with a parabolic profile with a central dip of 150 mm and with no eccentricity at the ends. The effective prestressing force is 875 kN. Take the density of concrete as 24 kN/m$^3$. Determine:

(a) The principal stresses at the support section.

(b) The principal stresses at the support section without prestress.

6 Explain the various steps involved in the design of end block by "Magnel's Method".

7 A rectangular concrete beam of cross-section 150 mm wide and 300 mm deep is simply supported over a span of 8 m and is prestressed by means of symmetric parabolic cable, at a distance of 75 mm from the bottom of the beam at mid span and 125 mm from the top of the beam at support sections. If the force in the cable is 350 kN and the modulus of elasticity of concrete is 38 kN/mm$^2$, calculate

(a) The deflection at mid span when the beam is supporting its own weight and

(b) The concentrated load which must be applied at mid span to restore it to the level of supports. Take the density of concrete as 24 kN/m$^3$.

8 A prestressed concrete composite beam section consists of a 500 mm × 75 mm cast in situ flange and 140 mm × 250 mm deep rectangular precast prestressed stem. The stress distribution for the precast stem section due to prestressing force alone is 16 N/mm$^2$ at the bottom to zero at the top. Find what uniformly distributed load the composite beam can carry on a simply supported span of 6 m for the condition that the stress at the bottom of the pre cast unit is zero for the following conditions:

(a) The DL of the slab and the weight of the shuttering are carried by the precast unit during casting and the shuttering is removed after the slab concrete is hardened.

(b) The DL of the slab is supported independently at the time of casting. Assume that the shuttering weights 270 N/m and the ratio elastic modulus for slab/elastic modulus for precast unit is 0.65. Take the density of concrete as 24 kN/m$^3$.

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