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BICEE-002

00361

B.TECH. CIVIL ENGINEERING (BTCLEVI)

Term-End Examination

December, 2013

BICEE-002 : PRESTRESSED CONCRETE

Time : 3 hours *Maximum Marks : 70*

*Note : (i) Answer **any five** questions.*

*(ii) Assume **any** suitable data.*

*(iii) **All** questions carry **equal** marks.*

1. Discuss the properties of high strength concrete and steel. Why high strength concrete and steel is required in prestressed concrete? Discuss its stress-strain characteristics. **14**

2. Write short notes on **any two** of the following : **2x7=14**

   (a) Short term and Long term deflections for prestressed members.

   (b) Various types of losses in prestress concrete.

   (c) Anchorage stress in post-tensioned members.

3. Discuss limit state of serviceability and control of deflection and cracking of prestressed concrete. **14**

4. A prestressed concrete beam, 200mm wide and 300mm deep, is prestressed with wires (area=320mm^2) located at a constant eccentricity of 50mm and carrying a initial stress of 1000 N/mm^2. The span of the beam is 10m long. Calculate the percentage loss of stress in wires if the beam is post-tensioned using the following data: **14**

$E_S = 210 kN/mm^2$ $E_C = 35 kN/mm^2$

Relaxation of steel stress = 5% of the initial stress

Shrinkage of concrete = 300×10^{-6} for pretensioning and 200×10^{-6} for post-tensioning

Frictional coefficient for wave effect = 0.0015/m.

5. A concrete beam having a rectangular section 100mm wide and 300mm deep is prestressed by a parabolic cable carrying an initial force of 240kN. The cable has an eccentricity of 50mm at the centre of span and is concentric at the supports. If the span of the beam is 10m long and the live load is 2kN/m, estimate the short time deflection at the centre of span Assuming $E = 38 kN/mm^2$ and creep coefficient = $\phi = 2.0$, loss of prestress = 20 percent of the initial stress after 6 months. Estimate the long time deflection at the centre of span at this stage assuming that the dead and live loads are simultaneously applied after the release of prestress. **14**

6. A rectangular concrete beam of cross-section 30cm deep and 20cm wide is prestressed by means of 15 wires of 5mm diameter located 6.5cm from the bottom of the beam and 3 wires of diameter 5mm, 2.5cm from the top. Assuming the prestress in the steel as 840N/mm^2, calculate the stress at the extreme fibres of the mid-span section when the beam is supporting its ownweight over a span of 6m. If a uniformly distributed live load of 6kN/m is imposed, evaluate the maximum working stress in concrete. The density of concrete is 24kN/m^3. **14**

7. The end block of a post-tensioned beam is 80mm wide and 160mm deep. A prestressing wire, 7mm in diameter, stressed to 1200 N/mm^2 has to be anchored against the end block at the centre. The anchorage plate is 50mm × 50mm. The wire bears on the plate through a female cone of 20mm diameter. Given the permissible stress in concrete at transfer $f_{ci} = 20N/mm^2$ and permissible shear in steel as 94.5 N/mm^2, determine the thickness of the anchorage plate. **14**