

**B.TECH. CIVIL ENGINEERING
(BTCLEVI)****Term-End Examination****December, 2012****BICEE-002 : PRESTRESSED CONCRETE***Time : 3 hours**Maximum Marks : 70*

Note : Answer any five questions. Assume any data if necessary. Use of scientific calculator is permitted.

1. What do you mean by High Strength concrete and steel ? Why high strength concrete and steel needed in prestressed concrete ? 14
2. A pre-tensioned beam of size 225×300 mm deep is prestressed by 10 wires of $5 \text{ mm}\Phi$ initially stressed at 1000 MPa. The centroid of prestressing wire is located at 100 mm from bottom. Grade of concrete m40. Relaxation of steel = 5%, $E_s = 2 \times 10^5 \text{ mpa}$. Creep coffn = 1.6. Calculate the different losses due to Elastic shortening, creep of concrete, creep of steel and shrinkage of concrete. 14
3. A concrete beam with Rectangular section 300 mm wide and 500 mm deep is prestressed by 2 post - tensioned cables of area 600 mm^2 each, 14

initially stressed to 1600 N/mm^2 . The cable are located at a constant eccentricity of 100 mm throughout the length of the beam having a span of 10 m . The modulus of elasticity of steel and concrete is 210 kN/mm^2 and 38 kN/mm^2 respectively.

- (a) Neglecting all losses, find the deflection at the centre of span when it supporting its own weight.
- (b) Allowing for 20 percent loss in prestress, find deflection at centre of span when it carries an imposed load of 18 kN/m . Assume Density of concrete = 24 kN/m^3 .

4. A pre-tensioned prestressed concrete beam of rectangular section is required to support a design ultimate moment 100 kNm . Design the section if f_{ck} is 50 N/mm^2 and $f_p = 16 \text{ N/mm}^2$. If b and d are the breadth and effective depth of the section respectively assuming the ratio $x_u/d = 0.5$. 14
5. The end block of a post - tensioned beam is 80 mm wide and 160 mm deep. A prestressing wire 7 mm in diameter, stressed to 1200 N/mm^2 has to be anchored against the end block at the centre. The anchorage plate is 50 mm by 50 mm . The wire bears on the plate through a female cone of 20 mm diameter. Given the permissible stress in concrete at transfer f_{ci} as 20 N/mm^2 and permissible shear in steel as 94.5 N/mm^2 , determine the thickness of the anchorage plate. 14

6. A prestressed concrete beam (span = 10 m) of rectangular section, 120 mm wide and 300 mm deep, is axially prestressed by a cable carrying an effective load of 5 kN/m which includes the self weight of the member. Compare the magnitude of the principal tension developed in the beam with and without the axial prestress. **14**
7. Write short notes on *any two* of the following : **14**
- (a) Anchorage stress in post tension members
 - (b) Short term and long term deflection
 - (c) Pretensioning and post-tensioning
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