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BICEE-002

B.Tech. CIVIL ENGINEERING (BTCLEVI)

Term-End Examination

00596

June, 2016

BICEE-002 : PRESTRESSED CONCRETE

Time : 3 hours *Maximum Marks : 70*

Note : *Answer any **five** questions. Assume any missing data, if necessary. Use of scientific calculator is permitted. Use of IS 1343 : 1980 is permitted.*

1. (a) Explain why high strength concrete and high strength steel are used for prestressed concrete construction. *7*

(b) Describe the stress concept to explain and analyze the basic behaviour of prestressed concrete. *7*

2. What are the various methods of prestressing ? Discuss the most widely used method of pre-tensioning and post-tensioning of concrete elements. *14*

3. (a) Enumerate the losses in prestress in prestressed concrete beams. Why are there no similar losses in reinforced concrete beams ? *5*

(b) In a prestressed concrete beam of cross-section 250 × 350 mm and span 6 m, an initial prestressing force of 350 kN is applied at an eccentricity of 70 mm, by tendons of area 400 mm^2. Assuming the modulus of elasticity of steel as 2×10^5 N/mm^2 and that of concrete as $0{\cdot}3 \times 10^5$ N/mm^2, find the total percentage loss of stress in tendons if slip in anchorage is 1·5 mm, creep coefficient in concrete is 1·0, shrinkage strain of concrete is 0·0002 and relaxation loss in steel is 3%. *9*

4. A concrete beam simply supported at both the ends with a rectangular section of 300 mm × 600 mm is prestressed by 2 post-tensioned cables of area 500 mm^2 each. The cables are located at a constant eccentricity of 100 mm throughout the beam of span 8 m. The cables are stressed to 1600 MPa initially. Calculate the maximum deflection of the beam when it carries an imposed load of 20 kN/m allowing 20% loss in prestress. Assume the modulus of elasticity of concrete and steel as $0{\cdot}3 \times 10^5$ N/mm^2 and 2×10^5 N/mm^2, respectively. Neglect the effect of shrinkage and creep. *14*

5. A rectangular simply supported prestressed concrete beam of cross-section 200 mm × 300 mm is prestressed by 15 numbers of 5 mm diameter wires located at 65 mm from soffit and 3 numbers of 5 mm diameter wires at 25 mm from the top. Assume effective stress in steel wires as 840 N/mm^2.

(a) Calculate the stresses in concrete at extreme fibres at mid-span section due to pressure and its own weight over a span of 6 m.

(b) If a uniformly distributed working load of 6 kN/m is imposed on the beam, obtain the maximum compressive stress in concrete. *14*

6. (a) What are the stresses to be checked in anchorage zone ? Explain in brief. *7*

(b) With the help of neat sketches, show the arrangement of reinforcement in end blocks. *7*

7. Write short notes on any ***four*** of the following : $4 \times 3\frac{1}{2} = 14$

(a) Advantages of prestressed concrete over RCC

(b) Effect of tendon profile on deflection of beams

(c) Modes of failure of prestressed concrete beams under shear

(d) Comparison of pre-and post-tensioning

(e) Magnel-Blaton system of post-tensioning