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BICEE-002

B.Tech. CIVIL ENGINEERING (BTCLEVI)

Term-End Examination

December, 2015

BICEE-002 : PRESTRESSED CONCRETE

Time : 3 hours *Maximum Marks : 70*

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

1. (a) Explain the essential requirements of steel and concrete for prestressed concrete. What are the advantages of prestressed concrete over reinforced concrete ? 7

(b) What are the different types of tensioning devices ? Explain in brief. 7

2. (a) How can the loss of stress due to shrinkage of concrete be accounted for in prestressed members ? 4

(b) A pretensioned beam of size 225 mm × 300 mm deep is prestressed by 12 wires, 5 mm diameter initially stressed at 1100 MPa. The centroid of the prestressing wires is located at 100 mm from bottom. Estimate the loss of prestress due to *10*

(i) elastic deformation

(ii) creep

(iii) shrinkage

(iv) relaxation

Grade of concrete = M40, relaxation of steel = 5%, $E_s = 2 \times 10^5$ MPa, creep coefficient = 1·6, residual shrinkage strain = 3×10^{-4}.

3. (a) Explain the concept of load balancing. *7*

(b) Enlist the factors influencing deflection of prestressed concrete members. *7*

4. A prestressed concrete beam 400 mm wide and 600 mm deep has a span of 6 m. The beam is prestressed with a tendon bent as shown in Figure 1. There is a central concentrated load of 180 kN acting on the beam. Effective prestressing force is 1200 kN. Calculate the extreme fibre stresses at mid span taking into account the self weight of beam also. *14*

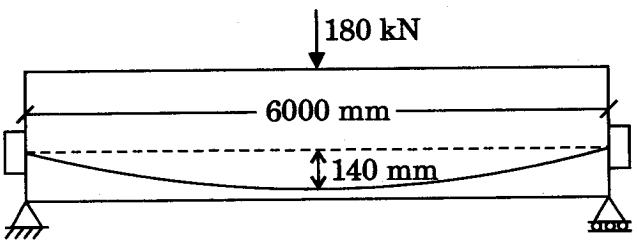

Figure 1

5. The prestressed concrete beam shown in Figure 2, provided with 9 wires of 4 mm diameter, is subjected to a prestress of 800 N/mm^2. Determine the sagging moment that can be applied to the section, so that the maximum compressive stress in concrete shall not exceed 14 N/mm^2 and the maximum tensile stress in concrete shall not exceed 1·4 N/mm^2. Neglect the losses in prestress. *14*

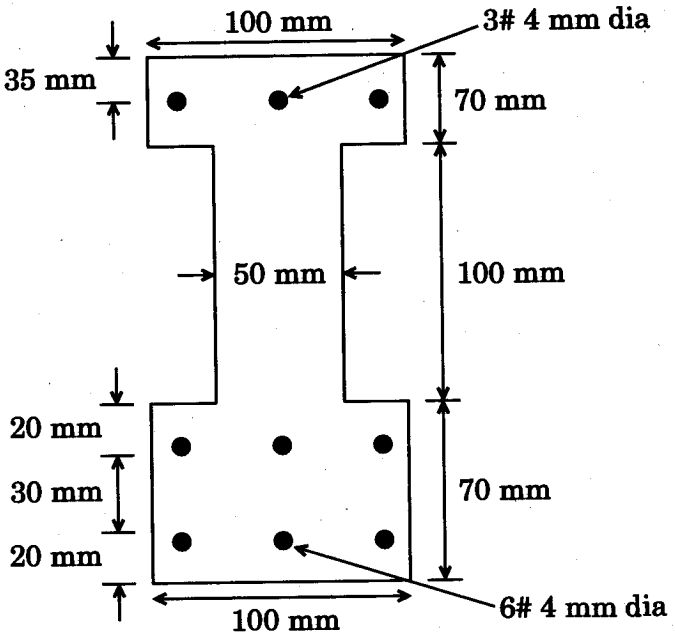

Figure 2

6. Explain the bearing stresses and bursting tensile stresses in end blocks. Discuss the steps for design of bearing and bursting tensile stresses in end block. *14*

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

(a) Concordant cable profile

(b) Strength concept of analysis of prestressed concrete

(c) Freyssinet system of post-tensioning

(d) Tendon splices

(e) Advantages and disadvantages of pretensioning systems