MODEL QUESTION PAPER

Seventh Semester B Tech Examination

13.705.1 PRE-STRESSED CONCRETE (C)

Time : 3 hrs **Max. Marks: 100**

Instructions:

1. Use of IS 456: 2000, IS 3370: Part IV: 2009 and IS 1343: 1980 is permitted.
2. Answer all questions in Part A and one question from each module in Part B. Each question in part A carries 4 marks and in part B carries 20 marks.
3. Assume any missing data suitably.

Part A

1. Explain any Post-tensioning method of prestressing with the aid of a neat sketch.
2. Why only high strength concrete and high tensile steel are used in prestressed concrete?
3. Discuss the IS method of design of end block.
4. Explain partial prestressing. Discuss its merits and demerits.
5. What are the advantages of composite construction?

Part B

Module I

6. a. Discuss the advantages and disadvantages of prestressed concrete over reinforced concrete.
   b. Explain the loss of prestress due to friction.

or

7. A pretensioned concrete beam of width 200 mm and depth 450 mm is prestressed with 300 mm^2 of steel located at 100 mm from the soffit of the beam. The wires are initially tensioned to 1000 N/mm^2 . The span of the beam is 10 m. Calculate the loss of prestress, if loss due to relaxation of steel is 50 N/mm^2, shrinkage of concrete is 300 x 10^{-6}, creep coefficient = 1.6, E_s= 2o0 kN/mm^2 and E_c = 31.5 kN/mm^2.

Module II

8. a. A pretensioned concrete beam of size 250 mm X 600 mm has an effective cover to tendon 200 mm. Area of prestressing steel is 565 mm^2, f_{ck} = 40 N/mm^2, f_p = 1600 N/mm^2. Calculate the ultimate flexural strength of the section.
   b. Explain the method of determining ultimate shear resistance of prestressed concrete beams.

or

9. Design a Type I post-tensioned beam of rectangular section to carry a live load of 15 kN/m over a simply supported span of 12 m. Strength of concrete at transfer is 42 N/mm^2 and at 28 days is 60 N/mm^2. Loss of prestress = 15%. Use 5 mm diameter wires with f_p = 1500 N/mm^2.

Module III

10. A two span continuous beam ABC (AB = BC = 12 m) has a uniform cross section with a width of 100 mm and depth of 300 mm. A cable carrying an effective prestressing force of 500 kN is provided at a constant eccentricity of 75mm towards soffit of the beam.
    a. Determine resultant moment developed at B due to prestressing only.
    b. Determine resultant moment developed at B when a load of 5kN/m is applied.

or

11. Design a post-tensioned slab of size 5m X 6m with discontinuous edges to carry a live load of 5 kN/m^2 . Use cables with 4 No.s 5 mm diameter wires initially stressed to 1000 N/mm^2 and M60 concrete.

Module IV

12. A precast pre-tensioned beam of rectangular section has a breadth of 300 mm and depth 900 mm and effective span 15m is prestressed by tendons with their centroids coinciding with the bottom kern. The initial force in the tendon is 1800 kN. Loss of prestress is 15 %. The beam is incorporated in a composite T- beam by casting a top flange of breadth 1200 mm and thickness 140 mm. If the composite beam supports live load of 6 kN/m^2, calculate the resultant stresses developed in the precast and in situ cast concrete assuming the pre-tensioned beam as unpropped. Assume the same modulus of elasticity for concrete in precast beam and in-situ cast slab. M40 grade concrete is used.

or

13. A non-cylinder prestressed concrete pipe of internal diameter 500 mm is designed to withstand a working pressure of 1.5 N/mm^2. High tensile wires of 5 mm diameter

stressed to 1500 N/mm^2 at transfer are used. Permissible maximum stresses in concrete at transfer and working loads are 13.5 N/mm^2 and 1.0 N/mm^2 (compressive) respectively. Loss ratio is 0.85. Determine the minimum thickness of concrete for the pipe and pitch of the wires used for prestressing.