MODEL QUESTION PAPER

Seventh Semester B Tech Examination

13.705.1 PRE-STRESSED CONCRETE (C)

Time : 3 hrs       Max. Marks: 100

Instructions:
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 $300 \times 10^{-6}$, creep coefficient = 1.6, $E_s = 200$ 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 mm², $f_{ck} = 40$ N/mm², $f_p = 1600$
N/mm². Calculate the ultimate flexural strength of the section.
b. Explain the method of determining ultimate shear resistance of prestressed
concrete beams.

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/mm² and at 28 days is 60 N/mm². Loss of prestress = 15%. Use 5 mm diameter
wires with $f_p = 1500$ N/mm².

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/m². Use cables with 4 No.s 5 mm diameter wires initially stressed
to 1000 N/mm² 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/m², 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/mm². 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.