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Question Paper Code : 52782

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Seventh Semester

Civil Engineering

CE 6702 — PRESTRESSED CONCRETE STRUCTURES

(Regulation 2013)

(Common to PTCE 6702 – Prestressed Concrete Structures for B.E. (Part-Time) Sixth Semester Civil Engineering – Regulation 2014)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the principle of post tensioning?

2. Mention the necessity of High strength concrete in Prestressing works.

3. What are the basic assumptions to calculate flexural stresses?

4. Mention the three way of improving the shear resistance of structural concrete members by prestressing techniques.

5. Differentiate short term and long term deflections in Prestressed concrete members.

6. Mention the method to find end anchorage stresses in post tensioned beams.

7. What is concordant cable profile?

8. Compare propped and un propped constructions.

9. Mention the principle of partial prestressing.

10. Write the types of prestressed concrete pipes.

PART B — (5 × 13 = 65 marks)

11. (a) A concrete beam is prestressed by a cable carrying an initial prestressing force of 300 kN. The c/s area of the wires in the cable is 300 mm². Calculate the percentage loss of stress in the cable due to shrinkage of concrete using IS:1343 recommendations assuming the beam to be (i) pre – tensioned and (ii) post tensioned. Assume E_s = 210 kN/mm². Age of concrete at transfer = 8 days. (13)

Or

(b) (i) Recall strength and load balancing concept. (5)

(ii) Explain the systems of prestressing. (8)

12. (a) A pre-tensioned beam, 80 mm wide and 120 mm deep, is to be designed to support working loads of 4 kN each concentrated at the third points over a span of 3 m. If the permissible stresses in tension are zero at transfer and 1.4 N/mm² under working loads, design the number of 3 mm wires and the corresponding eccentricity required at the mid span section. Permissible tensile stress in wires is 1400 N/mm². The loss of prestress is 20 percent and the density of concrete is 24 kN/m³. (13)

Or

(b) The support section of a prestressed concrete beam 100 wide and 250 mm deep is required to support an ultimate shear force of 60 kN. The compressive prestress at the centroidal axis is 5 N/mm². The characteristic cube strength of concrete is 40 N/mm². The cover to the tension reinforcement is 50 mm. If the characteristic tensile strength of steel in stirrups is 250 N/mm², design suitable shear reinforcements at the section using I.S code recommendations. (13)

13. (a) A prestressed concrete rectangular beam 350 mm wide and 800 deep is subjected to an effective prestress of 2600 kN. The shape of the cable is parabolic such that c.g. of the cable is at 260 mm from the bottom at the centre of the beam, whereas at ends c.g of cable is at 450 mm from bottom. The beam has a simply supported span of 8 m and is subjected to a uniformly distributed load of 60000 N/m. Find the resulting short time deflection at center. What will be the magnitude of the load for zero instantaneous deflection at centre? Assume $E_c = 4 \times 10^4$ N/mm². (13)

Or

(b) A high tensile cable comprising 12 strands of 15 mm diameter with an effective force of 2500 kN is anchored concentrically in an end block of a post tensioned beam. The end block is 400 mm wide and 800 mm deep and the anchor plate is 200 mm wide and 260 mm deep. Design suitable anchorage zone reinforcement using IS 1343 recommendation. (13)

14. (a) A composite T beam made up of pre tensioned rib 300 wide and 1000 mm deep and a cast in situ slab of 200 mm thickness and 150 mm wide. The modulus of elasticity of cast in situ slab is 28 N/mm². The differential shrinkage and creep is 0.0001. Determine the stresses caused by this on the precast and cast in situ concrete.

Or

(b) Explain the method of achieving continuity in continuous beam.

15. (a) Design a suitable section for the tie member of a truss to support a maximum design tensile force of 500 kN. The permissible compressive stress in concrete at transfer is 15 N/mm² and no tension is permitted under working loads. The loss ratio is 0.8. 7 mm diameter wires of the ultimate tensile strength of 1700 N/mm² with an initial stress of 950 N/mm² may be used. The direct tensile strength of concrete is 3 N/mm². A load factor of 2 at the limit state of collapse and 1.25 against cracking is required. (13)

Or

(b) (i) Recall the methods of achieving partial prestressing. (5)

(ii) Summarize the merits and demerits of partial prestressing. (8)

PART C — (1 × 15 = 15 marks)

16. (a) A two span continuous beam ABC (AB = BC = 10 m) is of rectangular section, 200 mm wide and 500 mm deep. The beam is prestressed by a parabolic cable, concentric at end supports and having eccentricity of 100 mm towards the soffit of the beam at centre of spans and 200 mm towards the top of beam at mid support. The effective force in the cable is 500 kN. Show that the cable is concordant and locate the pressure line in the beam when, in addition to its self weight, it supports an imposed load of 5.6 kN/m. (15)

Or

(b) Recall the design procedure for prestressed circular water tank. (15)

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