Reg. No. : | | | | | | | | | | | |

Question Paper Code : D 2096

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2010.

Eighth Semester

Civil Engineering

CE 1030 — PRE–STRESSED CONCRETE STRUCTURES

(Common to B.E. (Part–Time) – Seventh Semester – Regulation 2005)

(Regulation 2004)

Time : Three hours Maximum : 100 marks

(IS 1343 and IS 456 code of practice are permitted).

PART A — (10 × 2 = 20 marks)

Answer ALL questions.

1. Name the various methods of pre–stressing concrete.

2. Define Kern distance.

3. Draw a sketch showing the stress distribution in end block by double anchor plate.

4. Explain conventional failure of an over reinforced pre–stressed concrete beam.

5. What is the stress induced in concrete due to circular pre–stressing?

6. Explain the effect of pre–stressing force in concrete poles.

7. What are the roles played by shear connectors in composite construction?

8. What are the forces considered in the calculation of deflection of pre–stressed concrete beams?

9. Why the deck slab of pre–stressed concrete bridges is mostly made of non–pre–stressed concrete?

10. Draw the cross sectional profile of most commonly used pre–stressed concrete beams in bridges.

PART B — (5 × 16 = 80 marks)

11. (a) A rectangular concrete beam 230mm wide 450mm deep and 4m span is prestressed by 650 kN force at a constant eccentricity of 75mm. The beam supports three concentrated loads of 25kN at each quarter span points. Determine the location of the pressure line at the centre, quarter span and support sections of the beam. Neglect the moment due to self weight of the beam.

Or

(b) A rectangular concrete beam 150mm wide 300mm deep and 6m span with 87mm radius of gyration is prestressed by 8 wires of 8mm diameter by 400kN force. The tendon eccentricity at mid span is 75mm and zero at supports. The beam supports an udl of 5kN/m over the entire span. Determine the magnitude of central deflection for the following cases, ignoring all losses in prestress.

(i) Self weight + Prestress

(ii) Self weight + Prestress + Imposed load.

12. (a) A PSC T – section has 1800mm × 200mm flange, 450mm × 1500mm rib and 100 numbers of 8mm HTS wires located at 1600mm from the top of flange. Calculate the flexural strength of beam using M_{40} and Fe1600.

Or

(b) The end block of the PSC beam in problem 11(a), has a Freyssinet anchorage area of 9200mm2. Design and detail the anchorage reinforcement for the end block.

13. (a) (i) Explain the criteria of design and

(ii) Design procedure for PSC circular tanks. (8 + 8)

Or

(b) (i) With neat sketches, explain the various cross sectional profiles adopted for PSC poles. (8)

(ii) State the general advantages of PSC poles. (8)

14. (a) A simply supported PSC beam of span 5m and size 150mm × 300mm has 15MPa prestress at soffit and zero at top after all losses in prestress. A slab of 450mm wide and 60mm deep is cast on the top of the beam to induce composite T–beam action. Find the maximum udl that can be supported without any tensile stress at soffit for the following conditions.

(i) slab is externally supported during casting

(ii) slab is supported by the PSC beam during casting.

Or

(b) (i) Explain the advantages of using precast prestressed elements along with in–situ concrete. (8)

(ii) Explain different types of composite construction with sketches. (8)

15. (a) With figures, explain the construction sequence and tendons profiles of segmental PSC balanced cantilever bridges.

Or

(b) Write the design procedure of post tensioned PSC T–beam slab bridge deck.
