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Question Paper Code : 71796

M.E. DEGREE EXAMINATION, JUNE/JULY 2013.

Elective

Structural Engineering

ST 9263/ST 963/UST 9163/10211 SEE 71 — PRESTRESSED CONCRETE

(Regulation 2009/2010)

Time : Three hours Maximum : 100 marks

1. Answer the question in Part A & as per the choice in Part B.
2. Use IS 456 & IS 1343 code permitted.
3. Assume suitable data required.

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Why High strength steel is required for prestressing concrete?
2. List out the losses in the prestress concrete.
3. What are the types of flexural failure?
4. Write down the shear stress produced in rectangular and flanged section due to torsion?
5. State Guyon's theorem.
6. What are the advantages of continuous beam over the simply supported beam?
7. What are stages of design a prestressed concrete pipes?
8. Mention the factors which influence the behaviour and design of prestressed tension member.
9. Sketch any two types of composite construction.
10. What are applications of partial prestressing concrete?

PART B — (5 × 16 = 80 marks)

11. (a) (i) A PSC beam 150 × 300 mm is to carry 10 kN/m load for a span of 5 m. The beam is prestressed by a parabolic cable having 25 mm and eccentricity above CGC at support and 100mm eccentricity below CGC at mid span. Take Ap = 300 mm^2, Ec =38 kN/m^2 and m = 6. Calculate the short term Deflection by taking Cc = 2. (10)

(ii) Explain about the types of prestressing. (6)

Or

(b) (i) A pretensioned prestressed concrete beam of 250 mm width and 400 mm depth is concentrically prestressed with 750 mm^2 of high tensile wire anchored to bulk heads with a stress of 1200 N/mm^2. If m = 6, compute the loss in prestress. (10)

(ii) Explain post tensioning system. (6)

12. (a) (i) The end block of a prestressing concrete beam 200 × 300 mm has two Freyssinet anchorage of diameter 100 mm with their centres at 70 mm from top and bottom of the block. The force transmitted by each cone is 200 kN. Design the end block. (12)

(ii) Briefly explain the concept of Magnel's method of end block design. (4)

Or

(b) (i) Compare the shear capacity of RCC and PSC beam. (4)

(ii) A prestressed concrete beam 150 × 250 mm is having bending stress distribution of zero at top and 7.5 N/mm^2 at bottom. The shear force at the section is 250 kN. Find the principal tensile stress at the centroidal axis and comment on the shear reinforcement. (12)

13. (a) Explain the following terms with example

(i) Linear transformation (6)

(ii) Concordant profile (5)

(iii) Method of achieving continuity. (5)

Or

(b) A two span continuous beam ABC (AB = BC = 8m) is prestressed with parabolic cable, concentric at end supports and 150 mm eccentricity towards the soffit of the beam at mid span and 100 mm towards top at mid span support. The effective prestressing force is 600 kN. Locate the pressure line. (16)

14. (a) (i) Design a prestressed concrete column to carry a load of 120 kN and bending moment of 15 kNm. Its actual length is 3.5 m. (10)

(ii) Mention the advantage of prestressed concrete pipes. (6)

Or

(b) (i) Briefly explain the effects of prestressing in a water tank. (6)

(ii) Design a tension member of length 18 m carries an axial load of 1000 kN. Use M45 grade of concrete and steel of characteristic strength 1500 N/mm^2. Take permissible tensile stress as 2 N/mm^2. (10)

15. (a) Design a T-beam composite section to carry a live load of 10 kN/m^2 on a span of 6 m. Use allowable stresses as 50 N/mm^2 in precast unit and 15N/mm^2 in situ concrete. (16)

Or

(b) Design a partially prestressed post tensioned beam (class 3) to suit the following data.

Effective span = 25 m

Live load = 10 kN/m

Dead load (excluding self weight) = 2.5 kN/m

Load factor = 1.4 (dead load) and 1.6 (live load)

Compressive strength = 60 N/mm^2

Strength of concrete at transfer = 40 N/mm^2

Loss ratio = 0.85

Tensile strength 1.7 N/mm^2

Permissible tensile stress under service loads = 6 N/mm^2

Maximum width of crack = 0.1 mm

8 mm diameter high tensile wires having an ultimate tensile strength of 1800 N/mm^2 is available for use. (16)
