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Question Paper Code : 60266

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

Seventh Semester

Civil Engineering

CE 2404/CE 1402/CE 74/10111 CE 704 — PRESTRESSED CONCRETE STRUCTURES

(Regulations 2008/2010)

(Common to PTCE 2404/10111 CE 704 – Prestressed Concrete Structures for B.E. (Part- Time) Sixth Semester Civil Engineering – Regulations 2009/2010)

Time : Three hours Maximum : 100 marks

Use of IS : 1343 – 1980, 3370 (Part 4) – 1967 and 784 code is permitted.

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Why high strength steel is essential for prestressed concrete?

2. List down the factors that influence the deflection of prestressed concrete members.

3. Define Partial prestressing.

4. What do you understand by unbonded tendon?

5. How are the tanks classified based on the joint?

6. Define circular prestressing.

7. Define propped construction.

8. How to achieve compositeness between precast and cast in situ part?

9. Sketch the box girder, two cell bridge element.

10. What is meant by cross griders?

PART B — (5 × 16 = 80 marks)

11. (a) Explain the systems and methods of prestressing with neat sketches. (16)

Or

(b) A presstressed concrete beam of span 8m having a rectangular section of 150 mm × 300 mm the beam is prestressed by a parabolic cable having an eccentricity of 75 mm below the centroidal axis at the centre of the span and an eccestricity of 25 mm above the centroidal axis at the support sections. The initial force is the cable is 350 kN. The beam supports three concentrated loads of 10 kN each at intervals of 2m. $E_c = 38\ kN/mm^2$.

(i) Neglecting losses of prestress, estimate the short term deflection due to (prestress + self weight)

(ii) Allowing for 20% loss in prestress, estimate long term defection under (prestress + self weight + live load), assume creep co-efficient as 1.80. (16)

12. (a) Design a pretensioned beam for the following data:

Span	=	10m
L.L.	=	25 kN/m
Loss	=	20%
$\dot{\eta}$	=	0.8
f_{ck}	=	$40 N/mm^2$
f_{pi}	=	$1300 N/mm^2$. (16)

Or

(b) The end block of a post tensioned bridge girder is 500 mm wide by 1000 mm deep. Two cables, each comprising 90 high tensile wires of 7 mm did. Are anchored using square anchor plates of side length400 mm with their centres located at 500 mm from the top and bottom of the edges of the beam. The jacking force in each cable is 4000 kN. Design a suitable anchorage zone reinforcement using F4 415 grade HYSD bars conforming to IS : 1343 provision. (16)

13. (a) Design a cylindrical prestressed concrete water tank to suit the following data.

Capacity of tank = 3.5×10^6 liters. Ratio of diameter to height = 4. Maximum compressive stress in concrete at transfer not to exceed 14 N/mm^2 (compression). Minimum compressive stress under working load to be 1 N/mm^2. The prestress is to be provided by circumferential winding of 5 mm dia wires and by vertical cables of 12 wires of 7 mm diameter. The stress in wires at transfer 1000 N/mm^2. Loss ratio = 0.75. Design the walls of the tank and details of circumferential wire winding and vertical cables for the following joint condition at the base: Sliding base (Assume coefficient of friction as 0.5).

Or

(b) A prestressed concrete pipe of 1.2m diameter, having a core thickness of 75 mm is required to withstand a service pressure intensity of 1.2 N/mm^2. Estimate the pitch of 5 mm diameter high tensile wire winding if the initial stress is limited to 1000 N/mm^2.. Permissible stresses in concrete being 12.0 N/mm^2 in compression and zero in tension. The loss ratio is 0.8 if the direct tensile strength of concrete is 2.5 N/mm^2, estimate load factor against cracking.

14. (a) A precast pretensined beam of rectangular section has a breadth of 100 mm and depth 200 mm and effective span of 5m. The beam is prestressed with C.G. of steel coinciding with the bottom kern. The force at transfer in the tendons is 150 kN. Loss of prestress is 15%. The beam is incorporated in a composite 'T' beam by casting a top flange of breadth 400 mm and thickness 40 mm. The composite beam supports a live load of 7kN/m^2. Calculate the resultant stresses developed in the precast and in-situ concrete taking the pretensioned beam is unpropped during casting of the slab. M 40 and M 20 concrete arc used for pretensioned and in-situ concrete respectively.

Or

(b) A composite beam consists of an inverted prestressed T section with bottom flange 400 mm × 100 mm thick and web 100 mm × 200 mm deep. The prestressed portion is subjected to a triangular stress distribution across the depth zero at top and 10.5 N/mm^2 at bottom under effective prestress after all losses. The beam is erected on a simple span of 6 m and an in-situ concrete is laid to make the composite section 400mm × 400 mm overall. Estimate the live load the composite beam can carry, for zero stress at bottom of the mid span section. Assume relevant data.

15. (a) Explain the construction of pre-tensioned pre-stressed concrete bridge decks? Explain the advantages of pre-stressed concrete bridges. (16)

Or

(b) Design a post. tensioned pre-stressed concrete T-beam and slab bridge-deck to suit the following data:

Effective span 25 m, width of carriage-way = 7.5m, Kerbs 700mm wide on either side of road. Spacing of main and cross girders are 2 and 4 m respectively. Loading is IRC class A, adopt M50 grade concrete and high-tensile steel strands conforming to IS 6006 and supplementary reinforcement comprising Fe 415 grade HYSD bars. Permissible stress as specified in IRC 18 -- 1985, loss ratio is 85. (16)
