LIB
3/12/13 FN

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

Question Paper Code : 31218

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2013.

Seventh Semester

Civil Engineering

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

(Regulation 2008/2010)

(Common to PTCE 2404 — Prestressed Concrete Structures for B.E.(Part-Time) Fifth Semester Civil Engineering – Regulation 2009)

Time : Three hours Maximum : 100 marks

Use of IS : 1343–1980 code is permitted.

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. List the loss of prestress.
2. What are the classifications of prestressed concrete structures?
3. Mention any two functions of end blocks.
4. What are the merits and demerits of partial prestressing?
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. What are advantages of prestressed concrete bridges?
10. What are span range for solid slab and T-beam slab decks?

PART B — (5 × 16 = 80 marks)

11. (a) A prestressed concrete beam of section 120 mm wide by 300 mm deep is used over an effective span of 6 m to support a uniformly distributed load of 4 kN/m, which includes the self weight of the beam. The beam is prestressed by a straight cable carrying a force of 180 kN and located at eccentricity of 50 mm. Determine the location of the thrust – line in the beam and plot its position at quarter and central span section.

Or

(b) A rectangular concrete beam, 300 mm deep and 200 mm wide, is prestressed by means of fifteen 5 mm diameter wires located 65 mm from the bottom of the beam and three 5 mm wires, located 25 mm from the top of the beam. If the wires are initially tensioned to a stress of 840 N/mm^2, calculate the percentage loss of stress in steel immediately after transfer, allowing for the loss of stress due to elastic deformation of concrete only. $E_s = 210\ kN/mm^2$ and $E_c = 31.5\ kN/mm^2$.

12. (a) A pretensioned T-section has a flange 1200mm wide and 150mm thick. The width and depth of rib are 300 and 1500 mm respectively. The high – tensile steel has an area of 4700 mm^2 and is located at an effective depth of 1600 mm. If the characteristic cube strength of the concrete and the tensile strength of steel are 40 and 1600 N/mm^2 respectively, calculate the flexural strength of the T-section.

Or

(b) The end block of a prestressed concrete beam, rectangular in section, is 100mm wide and 200mm deep. The prestressing force of 100 kN is transmitted to concrete by a distribution plate, 100 mm wide and 50 mm deep, concentrically located at the ends. Calculate the position and magnitude of the maximum tensile stress on the horizontal section through the center and edge of the anchor plate. Compute the bursting tension on these horizontal planes.

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 1.2 m 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 rectangular pretensioned concrete beam has a breadth of 100mm and depth of 230 mm, and the pre stress after all losses have occurred is 12 N/mm^2 at the soffit and zero at top. The beam is incorporated in a composite Tee beam by casting a top flange of breadth 300 mm and depth 50 mm.

Calculate the maximum uniformly distributed load that can supports on a simply supported span of 4.5m, without any tensile stress occurring.

(i) If the slab is externally supported while casting and

(ii) If the pre-tensioned beam supports the weight of the slab while casting.

Or

(b) Write step by step design procedure for composite construction.

15. (a) Write design procedure for post – tensioned prestressed concrete slab bridge deck.

Or

(b) Explain in detail the general aspects of pre tensioned and post tensioned concrete bridge decks and mention its advantages.

———————