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Question Paper Code : X 60265

B.E./B.Tech. DEGREE EXAMINATIONS, NOV./DEC. 2020

Seventh Semester

Civil Engineering

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

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

(Regulations 2008/2010)

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 **(10×2=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. Brief the over reinforced failures in pre stressed concrete.
4. What are the limitations of pre stress in long spans ?
5. How are the tanks classified based on the joint ?
6. Define circular prestressing.
7. What is shear connectors ?
8. How do you form the bonding between prestressed units and reinforced units ?
9. What are the various loads on railway sleepers ? Explain.
10. Explain the different types of pretensioned prestressed concrete bridge decks with relevant figures.

PART – B **(5×16=80 Marks)**

11. a) i) Explain the concept of load balancing. **(8)**

ii) What is meant by high tensile steel ? Explain the types of high tensile steel. **(8)**

(OR)

b) Explain the factors influencing deflection. Explain the short term and long term deflection. **(16)**

12. a) A pretensioned T-section has a flange 1200 mm wide and 150 mm 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. **(16)**

(OR)

b) The end block of a prestressed concrete beam, rectangular in section, is 100 mm wide and 200 mm 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. **(16)**

13. a) A cylindrical prestressed concrete water tank of internal diameter 30 m is required to store water over a depth of 7.5 m. The permissible compressive stress in concrete at transfer is 13 N/mm^2 and the minimum compressive stress under pressure is 1. The loss ratio is 0.75. Wires of 5 mm diameter with an initial stress of 1000 N/mm^2 are available for circumferential winding and Freyssinet cables made up of 12 wires of 8 mm diameter stressed to 1200 N/mm^2 are to be used for vertical prestressing. Design the tank walls assume the base as fixed. Adopt M40 grade concrete. **(16)**

(OR)

b) Design a non-cylinder prestressed concrete pipe of internal diameter 500 mm to withstand a working pressure of 1 N/mm^2. High-tensile wires of 2 mm diameter stressed to 1200 N/mm^2 at transfer are available for use. Permissible maximum and minimum stresses in concrete at transfer and working loads are 13.5 N/mm^2 and 0.8 N/mm^2 (compression) respectively. Loss ratio = 0.8, E_s = 210 kN/mm^2 and E_c = 35 kN/mm^2. Calculate, (i) the minimum thickness of concrete for the pipe, (ii) number of turns of wire per metre length of the pipe, (iii) the test pressure required to produce a tensile stress of 0.7 N/mm^2 in the concrete when applied immediately after tensioning and (iv) the winding stress in the steel. **(16)**

14. a) Design a composite PSC beam for the following data :

Span	=	12 m
L.L.	=	5 kN/m^2
σ_{ci}	=	14 N/mm^2
ṅ	=	85%
depth of slab	=	150 mm
f_{pe}	=	950 N/mm^2
m	=	0.6
Spacing of beam	=	3.5 m
Breadth of web	=	150 mm
b_f	=	1500 mm

Assume post tension. **(16)**

(OR)

b) Design a composite slab for the bridge deck using a standard inverted T-section. The top flange is 300 mm wide and 110 mm thick. The bottom flange is 550 mm wide and 250 mm thick. The web thickness is 100 mm and the overall depth of the inverted T-section is 655 mm. The bridge deck has to support a characteristic imposed load of 50 kN/m^2. Over an effective span of 12 m. Grade – 10 concrete is specified for the pre-tensioned T-with a compressive strength at transfer of 36 N/mm^2. Concrete of grade-30 is used for the in situ part. Determine the minimum prestress necessary and check for safety under serviceability limit state. **(16)**

15. a) Discuss on the steps involved in the design of pretensioned prestressed concrete bridge deck. **(16)**

(OR)

b) Write the design procedure for post tensioned bridge girders. **(16)**

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