Regulation: R18 *Subject Code: 2E6AA*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A' Grade)

B.Tech VI Semester Supplementary Examinations, June/July 2023

PRESTRESSED CONCRETE

(Civil Engineering)

Maximum Marks: 70 Date:03.07.2023 Duration: 3 hours

Note: 1. This question paper contains two parts A and B.
2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
3. Part B consists of questions from 5 Units. Answer any one full question from each unit.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

IS 1343 CODE BOOK IS ALLOWED

Part-A

All the following questions carry equal marks (10x2M = 20 Marks)

1. Distinguish between Pre-tensioning and Post-tensioning.
2. What is debonding?
3. List the various types of loss of prestress in post tension members.
4. Types of losses in post-tensioning
5. State Hoyer Effect?
6. Draw the stress diagram for eccentric loading?
7. Define Transmission Length.
8. Give equation to find out Bond Length.
9. What is a composite beam?
10. What are short term deflection and long term deflection?

Part-B

Answer All the following questions. (5x10M = 50 Marks)

11. Explain the various systems of prestressing with a neat typical sketch. [10]

OR

12. Explain the significance of high strength concrete and high tensile steel in PSC members. [10]

13 A post-tensioned concrete beam of rectangular section, 100 mm wide and 300 mm deep, is stressed by a parabolic cable with zero eccentricity at the supports and an eccentricity of 50 mm at the centre of span. The area of the cable is 200 mm^2 and initial stress in the cable is 12 N/mm^2. If the ultimate creep strain is 30×10^{-6} mm/mm per N/mm^2 of stress and modulus of elasticity of steel is $2X10^5$ N/mm^2, compute the loss of stress in steel only due to creep of concrete. Assume any other missing data. [10]

OR

14. A concrete beam is prestressed by a cable carrying an initial prestressing force of 335 kN. The cross sectional area of wires is 320mm^2. Calculate the percentage loss of stress in the cable only due to shrinkage of concrete using IS-1343 recommendations assuming the beam to be
    a) Pre-tensioned.
    b) Post-tensioned.

    Take E_S = 210 kN/mm^2. Age of concrete at the time of transfer = 10 days. [10]

15. A Rectangular concrete beam 250mm wide by 300 mm deep is prestressed by a force of 540KN at a constant eccentricity of 60mm. The beam supports a concentrated load of 68 kN at the center of a span of 3m. Determine the location of the pressure line at the center, quarter span and support sections of the steam. Neglect the self-weight of the beam. [10]

OR

16. A pre stressed concrete beam of rectangular section 300mm by 600 mm is 12m long. Supports a live load of 12 kN/m in addition to its own self-weight. The beam is pre stressed by a cable having high tensile wires of 2000 mm^2 area stressed of 175mm from the soffit of the beam. Determine the shift in the pressure line at one quarter span and centre of span, when the beam supports the service load. [10]

17. A prestressing force of 250 KN is transmitted through a distribution plate 120 mm wide and 120 mm deep, the centre of which is located at 100 mm from the bottom of an end block having a section 120 mm wide and 300 mm deep. Evaluate the position and magnitude of the maximum tensile stress on a horizontal section passing through the centre of the distribution plate using the Rowe method. Find the area of steel necessary to resist the largest tensile force resulting from any of these methods. Yield stress in steel = 260N/mm^2. Assume any other missing data. [10]

OR

18. The end block of post-tensioned prestressed concrete Beam 300mm wide and 30mm deep, is subjected to a concentric anchorage force of 832.8 kN by a Freyssinet anchorage of area 11720mm^2. Design and detail the anchorage reinforcement of the end Block. [10]

19. (a)What are the advantages of using composite construction with prestressed and in-situ concrete in structural members? [5]
(b) Sketch some typical cross sections of composite bridge decks with precast prestressed elements. [5]

OR

20. A simply supported beam with a uniform section spanning over 6 m is post-tensioned by two cables, both of which have an eccentricity of 100 mm below the centroid of the section at mid-span. The first cable is parabolic and is anchored at an eccentricity of 100 mm above the centroid at each end, the second cable is straight and parallel to the line joining the supports. The cross sectional area of each cable is 100 mm^2 and they carry an initial stress of 1200 N/mm^2. The concrete has a cross section of $2x10^4$ $mm^2$and radius of gyration of 120 mm. The beam supports uniformly distributed load (includes dead + live load) of 20 kN/m^2. E_c = 38 kN/mm^2. Calculate using Lin's simplified method (a) The Instantaneous deflection at centre of span, and (b) the deflection at the centre of span after two years, assuming 20% loss in prestress and the effective modulus of elasticity to be one-third of the short-term modulus of elasticity. [10]