Roll No. ☐☐☐☐☐☐☐☐☐☐☐☐   Total No. of Pages : 02

Total No. of Questions : 09

B.Tech. (CE) (2011 Onwards E-I & II)   (Sem.–7,8)
PRE-STRESSED CONCRETE
Subject Code : BTCE-809
Paper ID : [A2963]

Time : 3 Hrs.   Max. Marks : 60

INSTRUCTION TO CANDIDATES :
1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students has to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students has to attempt any TWO questions.**
4. **Use of IS : 1343 is allowed**
5. **Assume any missing data.**

SECTION-A

1. **Answer briefly :**

    a) How load carrying mechanism of prestressed beam is differ from the R.C.C beam?

    b) List out the various post tensioning anchorage devices.

    c) What is the deflection in prestressed beam due to parabolic and straight tendons?

    d) How prestressing of concrete beam effects its shear strength?

    e) List the various methods generally used for the design of high strength concrete mixes.

    f) How the flexural shear cracks are developed?

    g) List out the various methods by which bond between concrete and steel tendons can be improved.

    h) Distinguish between short term and long term deflection of prestressed concrete beams.

    i) List out the various modes of failure encountered in prestressed concrete beams subjected to bending moment, shear and torsion.

    j) State the term "*Transfer*".

SECTION-B

2. What are loop anchorages? Explain with sketches Baur-Leonhardt system of post-tensioning.

3.   A prestressed concrete beam of section 135 mm wide by 350 mm deep is used over an effective span of 8 m to support a uniformly distributed load of 5 kN/m, which includes the self weight of the beam. The beam is prestressed by a straight cable carrying a force of 200 kN and located at an eccentricity of 55 mm. Determine the location of the thrust-line in the beam and plot its position at quarter and central span sections.

4.   Explain the strain compatibility method of computing the flexural strength of concrete sections with tension and compression reinforcement.

5.   A post - tensioned prestressed concrete beam, 300 mm wide by 600 mm deep, is provided with 2 cables of 50 mm diameter each containing 12 wires of 8 mm diameter. The effective cover to the cables is 100 mm. The modulus of elasticity of steel and concrete are 210 and 35 kN/mm^2 respectively. The beam spans 12 m and supports a uniformly distributes live load of 50 kN/m. if the cables are grouted before the application of live loads, calculate the unit bond stress,

   a)   Between each wire and grout;

   b)   Between the cable hose and concrete.

6.   Explain Guyon's method of computing bursting tension in case of end blocks subjected to forces not evenly distributed with multiple anchorages.

SECTION-C

7.   A post tensioned bonded prestressed beam of rectangular section 500 mm wide by 700 mm deep, is subjected to a service load B.M of 175 kNm, torsional moment of 55.5 kNm, and shear force of 66 kN. The section has an effective prestressing force 550 kN at an eccentricity of 150 mm, provided by 5 bars of 12.5 mm stress -relieved strands of cross sectional area 505 mm^2 with an ultimate tensile stress of 1820 N/mm^2. If cube strength of concrete is 40 N/mm^2, design the longitudinal and transverse reinforcement in the beam using skew-bending theory.

8.   A prestress concrete beam spanning over 8 m is of rectangular section, 150 mm wide and 300 mm deep. The beam is prestressed by a parabolic cable having an eccentricity of 75 mm below the centroid axis at the centre of span and at an eccentricity of 25 mm above the centroid axis at the support sections. The initial force in the cable is 350 kN. The beam supports 3 concentrated loads of 10 kN each at interval of 2 m. Ec=38 kN/mm^2.

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

   b)   Allowing for 20% loss in prestress, estimate the long term deflection under (prestress + self weight+ live load), assuming creep coefficient as 1.80.

9.   a)   What is the effect of torsion on prestressed concrete section? How do you compute the shear stress developed in different types of cross sections due to torque?

   b)   What are the factors influencing the loss of stress due to creep of concrete?