Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Sem-I Regular Examination January / February 2011

Subject code: 712007N
Subject Name: Prestressed Concrete

Date: 03 /02 /2011 **Time: 02.30 pm – 05.00 pm**

Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Use of IS:1343-1980 is permitted.**

Q.1 **(a)** Explain the basic concept of Pre-stressing. Also write advantages and applications of Pre-stressed concrete. **07**

(b) A pre-stressed beam, 200 mm wide and 300 mm deep, is prestressed by 10 wires of 7 mm diameter initially stressed to 1200 N/mm^2, with their centroids located 100 mm from the soffit. Find the maximum stress in concrete immediately after transfer, allowing only for elastic shortening of concrete. **07**

If the concrete undergoes a further shortening due to creep and shrinkage while there is a relaxation of 5 per cent of steel stress, estimate the final percentage loss of stress in the wires using the Indian Standard Code (IS:1343-1980) regulations, and the following data:

Es = 210 kN/mm^2, Ec = 5700(f_{cu}) ^{½}, f_{cu} = 42 N/mm^2, creep co-efficient (Φ) = 1.6, Total residual shrinkage strain = 3 X10^{-4}

Q.2 **(a)** Which are the basic pre-stressing systems? Explain any one in detail. **07**

(b) Why high strength materials are required in pre-stressed concrete? Write strength requirements of steel and concrete. **07**

OR

(b) A concrete beam with a cross sectional area of 32 X 10^3 mm^2 and radius of gyration of 72 mm is Prestressed by a parabolic cable carrying an effective stress of 1000 N/mm^2. The span of the beam is 8 m. The cable, composed of 6 wires of 7 mm diameter, has an eccentricity of 50 mm at the centre and zero at the supports. Neglecting all losses, find the central deflection of the beam as follows: **07**

(a) Self weight + pre-stress and

(b) Self weight + pre-stress + live load of 2 kN/m

Q.3 **(a)** Write IS code provisions for computing the flexural strength of rectangular or T sections. **07**

(b) A prestressed, T-section has a flange 1200 mm wide and 150 mm thick. The width and depth of the 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 ultimate flexural strength of the T-section. **07**

OR

Q.3 **(a)** Write advantages of Composite construction. **07**

(b) What are the advantages of Partial prestressing? **07**

Q.4 **(a)** Explain the methods of achieving continuity in prestressed concrete. **07**

(b) Write advantages and disadvantages of prestressed continuous members. **07**

OR

Q.4 **(a)** Give the classification of prestressed concrete pipes based on method of manufacturing with neat sketches.. **07**

(b) A prestressed cylinder pipe is to be designed using a steel cylinder of 1000 mm internal diameter and thickness 1.6 mm. the circumferential wire winding consists of a 4 mm high tensile wire, initially tensioned to a stress of 1000 N/mm^2. Ultimate tensile strength of the wire is 1600 N/mm^2. Yield stress of the steel cylinder is 280 N/mm^2. The maximum permissible compressive stress in concrete at transfer is 14 N/mm^2 and no tensile stresses are permitted under working pressure of 0.8 N/mm^2. Determine the thickness of the concrete lining required, the number of turns of circumferential wire winding and the factor of safety against bursting. Assume modular ratio as 6. **07**

Q.5 **(a)** Enumerate the advantages of prestressed concrete piles. **07**

(b) Why it is necessary to control the deflection. Explain the factors influencing deflection in prestressed concrete members. **07**

OR

Q.5 **(a)** Explain the transmission of prestressing force by bond. Also explain the term "Transmission length". **07**

(b) The support section of a prestressed concrete beam, 100 mm wide and 250 mm deep, is required to support an ultimate shear force of 60 kN. The compressive prestress at the centroidal axis is 5 N/mm^2. The characteristics cube strength of concrete is 40 N/mm^2. The cover to the tension reinforcement is 50 mm. if the characteristic tensile strength of steel in stirrups is 250 N/mm^2, design suitable reinforcements at the section using the IS:1343 recommendations. **07**

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