Seat No.: _____ *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – I • EXAMINATION – WINTER • 2013

Subject code: 711508N **Date: 06-01-2014**

Subject Name: Prestressed Concrete

Time: 10.30 am – 01.00 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 relevant IS 456 and SP 16 are permitted.**

Q.1 **(a)** A pre-stressed beam, 200 x 300 mm cross section is prestressed by 12 straight wires of 7mm diameter. The initial prestress applied to section is 1200MPa. The centroid of steel is located at 175 mm from the soffit. Find the maximum stress in concrete immediately after transfer. If the concrete undergoes a further shortening due to creep and shrinkage and steel gets relaxed by 5 per cent, calculate the final percentage loss of stress in the wires using the Indian Standard Code (IS:1343-1980) regulations, and the following data: **14**

E_s = 210 GPa, $E_c = 5000(f_{cu})^{1/2}$, f_{cu} = 40 MPa creep co-efficient (Φ) = 1.6, Total residual shrinkage strain = 3×10^{-4}

Q.2 **(a)** How will you fix cable profile for a simply supported beam of span L carrying (i) eccentric point load (ii) UDL and (iii) Two equal point loads each at L/3 from supports. Neglect self weight of beam. **07**

(b) A rectangular concrete beam, 200 x 500mm is prestressed by means of 12 - 4mm diameter high-tensile bars located 150mm from the soffit of the beam. If the effective stress in the wires is 700MPa, what is the maximum bending moment that can be applied to the section without causing tension at the soffit of the beam? **07**

OR

(b) Explain any one prestressing system used in post-tensioned beams in detail. **07**

Q.3 **(a)** Differentiate between prestressed, partially prestressed and reinforced concrete. **06**

(b) A prestressed concrete beam of length 5m, width 200mm and depth 300mm is subjected to UDL of 10kN/m (neglect its self weight). The beam is prestressed by straight cable carrying a force of 250 kN and located at an eccentricity of 75 mm. Determine the location of thrust line in the beam (shift of central and quarter position). **08**

OR

Q.3 **(a)** State different types of losses encountered in the pre-tensioning and post-tensioning systems. Explain any one. **07**

(b) Write steps for computing the flexural strength (as per IS code provisions) of (i) rectangular and (ii) T sections. **07**

Q.4 **(a)** Write advantages and disadvantages of prestressed continuous members. **07**

(b) A simply supported prestressed concrete beam having rectangular section 150x500mm, spans over 7.5m. It is prestressed by a straight cable having eccentricity 125mm. The working load acting over the beam is limited to **07**

15kN/m. Determine central deflection of beam at
(i) Transfer stage: When prestressing force 225kN and characteristic cube strength 40MPa.
(ii) Final stage: When prestressing force 300kN and characteristic cube strength 50MPa.
Neglect loss in prestress.

OR

Q.4 **(a)** A prestressed I– section concrete beam with flange 200x75mm and web 450x75mm is prestressed by 250mm^2 prestressing wires. The wires are placed at eccentricity of 175mm at center of span and zero eccentricity at ends, in straight inclined profile. It carries final prestress of 1500MPa. The beam has simply supported span 9m and carries a UDL 15kN/m. Design required shear reinforcement. **08**

(b) Why high strength materials are required in pre-stressed concrete? Write strength requirements of steel and concrete. **06**

Q.5 Define following terms (any seven) **14**

1) Tendon	2) Axial Prestressing
3) Eccentric Prestressing	4) Concordant Prestressing
5) Circular Prestressing	6) Transmission length
7) Degree of Prestressing	8)Anchorage
9) Transmission length	10) Vertical prestressing
11) Steel relaxation	12)Wobbling effect
13) Bursting stress	14) Elastic shortening

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