

GUJARAT TECHNOLOGICAL UNIVERSITY
M. E. - SEMESTER – I • EXAMINATION – SUMMER • 2014

Subject code: 711508N**Date: 24-06-2014****Subject Name: Prestressed Concrete****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. IS 456, IS 1343, IS 1980, IS 3370 and SP 16 are permitted.

- Q.1** A simply supported post tensioned I - section beam having effective span 25m is a class-I structure. It carries a uniformly distributed load of intensity 25kN/m. The cube strength at transfer is 32MPa and at service loads is 48MPa. The beam is prestressed by steel having characteristic strength 1650MPa. Assume parabolic cable profile and losses in prestress as 15%. Design suitable cross section, cable locations and amount of prestressing steel for flexure. Check suitability of section at mid span section only. **14**
- Q.2 (a)** Explain in brief following terms used in prestressed concrete: (i) End Block (ii) Transmission length (iii) Cap cable. **07**
- (b)** Explain in brief following terms used in prestressed concrete: (i) Tendon (ii) Bonded prestressed concrete (iii) Transfer. **07**
- OR**
- (b)** 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**
- Q.3 (a)** Elaborate any one prestressing system used in post-tensioned beams in detail. **07**
- (b)** What are the losses occur in prestressed concrete? Explain any one of them. **07**
- OR**
- Q.3 (a)** State and explain the reasons for using the high strength materials in prestressed concrete. **07**
- (b)** Derive expression to fix the limiting zone for the prestressing force in vertical plane of given cross-section for given loading and, sectional and material properties **07**
- Q.4** A simply supported prestressed concrete beam having rectangular section 200 x 450 mm, spans over 8.4 m. The beam is prestressed by a straight cable at eccentricity 100 mm. Working load over beam is 12 kN/m. Check the deflection of beam at (i) Transfer stage: Prestressing force 180kN and characteristic cube strength 32MPa. (ii) Final stage: Prestressing force 220kN and characteristic cube strength 45MPa. **14**
- OR**
- Q.4** A post-tensioned box section girder has overall dimensions 1200x 600 mm with wall thickness 125 mm. The girder is prestressed by 12 nos. 7 ply-8 mm strands with effective cover 75 mm at bottom. The characteristic strength of concrete and steel is 45MPa and 1600MPa respectively. Calculate moment of resistance of the section. **14**

- Q.5 (a)** A prestressed I section concrete beam with flanges 140 x 40 mm and web 280 x 40mm is prestressed with 220mm² prestressing wires. The wires are placed at eccentricity of 120mm at center of span and zero eccentricity at ends, in parabolic profile. It carries final prestress of 1250 MPa. The beam has simply supported span 11 m and carries a UDL 12 kN/m and central point load 30 kN. It carries a constant torsional moment 30 kNm along its length. Design required shear reinforcement. **10**

- (b)** State the advantage of continuous members in prestressed concrete structures. Also, explain the load balancing concept in beams **04**

OR

- Q.5 (a)** Design a non cylindrical pipe of 750mm diameter for water supply at working pressure 1.2 N/mm². Find the pitch of 2mm diameter wires if initial prestress is to be limited to 1350 N/mm². Take cube strength at transfer = 28 N/mm². Residual compression in concrete is required to be 2.2 N/mm². Find safety factor against cracking at working stage. Losses are 16%. The cube strength at working stage is 42 N/mm². **10**

- (b)** Briefly explain the advantage of prestressing long span shell structures. Also, explain with neat sketches the different type of cross-sections generally used for poles. **04**
