

GUJARAT TECHNOLOGICAL UNIVERSITY
M. E. - SEMESTER – I • EXAMINATION – WINTER 2012

Subject code: 711508N**Date: 16/01/2013****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. Use of IS 1343, IS 3370 and IS 456 is permitted.

Q.1 Design a class-I post tensioned simply supported I- section beam having center to center span 20m. The beam carries a uniformly distributed load of intensity 50kN/m. The concrete strength at transfer is 45MPa and at service loads is 50MPa. Assume parabolic cable profile and prestress losses as 15%. Propose a suitable cross section, cable profile and amount of prestressing steel for flexure at the center of span. The beam is prestressed by steel having characteristic strength 1750MPa. Design for flexure only. **14**

Q.2 (a) A prestressed cylindrical tank of diameter 12m and its height is 10m is used to contain water. Design the wall of water tank which is prestressed along its periphery by considering flexible base. The cube strength of concrete is 45MPa and characteristic strength of steel is 1800MPa. **07**

(b) Explain load balancing concept in beams **07**

OR

(b) Describe concept and various methods of pre-tensioning. **07**

Q.3 (a) Explain prestress loss due to elastic deformation by successive prestressing of cables. Explain with example. **06**

(b) A rectangular beam of span 10m and cross-section 300x500mm is prestressed by a parabolic cable with zero eccentricity at end and 125mm at center. The prestressing force is 1600kN. The beam carries a live load 40kN/m over its entire span. Calculate top and bottom fiber stress at center of span. **08**

OR

Q.3 (a) A post tensioned cable of a beam 10m long is initially tensioned to a stress of 1000MPa at one end. If the tendons are curved so that the slope is 1 in 15 at each end with an area of 600mm². Calculate loss due to friction and slip if coefficient of friction between duct and cable is 0.55 and coefficient of wave effect is 0.0015/m and there is slip of 3mm at jacking end. **07**

(b) A prestressed pipe having diameter 200mm and shell thickness 75mm needs to withstand a working pressure 1.20N/mm². Estimate the pitch of 5mm diameter wires if initial prestress is limited to 1000N/mm² in compression and zero in tension. The loss ratio is 0.8. If the direct tensile strength is 2.5N/mm² and cube strength at transfer is 40N/mm². Estimate the load factor against cracking. **07**

Q.4 (a) What is linear, vertical and circular prestressing? Explain where these **04**

type of prestressing is used.

- (b) A simply supported prestressed concrete beam having rectangular section 120x300mm, spans over 6m. The beam is loaded by a UDL of intensity 3kN/m. A prestressing force of magnitude 180kN is applied at a constant eccentricity of 50mm. The characteristic strength of cube is 40MPa and modulus of rupture 5MPa. The area of cable is 200mm² and modular ratio is 6. Estimate central deflection of beam at (i) Working load (ii) Cracking load (iii) 1.5 times the cracking load. **10**

OR

- Q.4** (a) The end block of a post tensioned prestressed beam 100x200mm is subjected to a concentric anchorage force 100kN through a plate 100mm wide and 50mm deep. Calculate position and magnitude of maximum tensile stress on horizontal section through center of plate. Also compute bursting stress. **07**
- (b) A post tensioned T girder has flanges 300x200mm and web 150x500mm. The effective depth of cross section is 500mm. If area of prestressing steel is 200mm², characteristic strength of concrete is 50MPa and of steel is 1600MPa. Calculate moment of resistance of the section. **07**

- Q.5** (a) Design the section for shear for beam given in Q.1 **07**
- (b) A prestressed rectangular concrete beam having dimension 100x250mm required to carry a shear force 60kN. The compressive stress due to prestressing force is 5MPa at centroidal axis. The characteristic strength of concrete is 40MPa. The cover to the reinforcement is 50mm and characteristic strength of stirrup steel is 250MPa. Calculate steel required to account shear. **07**

OR

- Q.5** (a) Explain various anchorage systems for post-tensioned beams. **08**
- (b) Write a short note on **06**
- (i) Principal stress at center and bottom of rectangular prestressed beam
- (ii) Class of structure in prestressed concrete
- (iii) Pre-tensioned and post tensioned concrete.
