Seat No: _____ Enrollment No: _____

PARUL UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

M.Tech., Summer 2017 - 18 Examination

Semester: 1 **Date: 31/05/2018**
Subject Code: 03209131 **Time: 02:00 PM to 04:30 PM**
Subject Name: Prestressed Concrete **Total Marks: 60**

Instructions:
1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.
5. Use of IS:1343 is allowed.

Q.1 (A) Objective Type Questions (All are compulsory) (Each of one mark) **(05)**

1) In Prestressed concrete member, the steel is under
   (a) Compression (b) Tension (c) torsion
2) In axially pressed member, the concrete is under
   (a) Tension (b) compression (c) torsion
3) Creep of concrete in a structural member is due to
   (a) Elastic strain (b) elasto-plastic strain (c) inelastic strain
4) Circular prestressing of concrete tanks induces
   (a) Hoop tension (b) hoop compression (c) flexural compression
5) In post-tensioning system is based on the principle of
   (a) wires are first tensioned followed by concreting
   (b) tensioning of wired and concreting is simultaneously done
   (c) Wedge action producing frictional grip between steel and concrete.

(B) Define the following **(05)**

1) Creep Coefficient
2) Characteristic Load
3) Tendon
4) Transmission Length
5) Stress at Transfer

(C) What are different types of losses in pre-tensioning and post tensioning. How can you reduce losses in pre-stressing concrete **(05)**

Q.2 Answer the following questions. (Attempt any three) (Each five mark) **(15)**

(A) A prestressed girder has to be designed to cover a span of 12m, to support an uniformly distribution live load of 15kN/m. M-45 grade of concrete is used for casting the girder. The permissible stress in compression may be assumed as 14 N/mm2 and 1.4 N/mm2 in tension. Assume 15 %losses, I section with flanges 300mm wide and 150mm thick. The web is 120mm wide by 450mm deep. Design the minimum prestressing force and the corresponding eccentricity for the section.

(B) A pretensioned, T-section has a flange which is 300mm wide 200mm thick. The rib is 150 mm wide by 350mm deep. The effective depth of the cross section is 500 mm. Given A_P=200 mm^2, f_{ck}=50N/mm2 and f_p=1600N/mm^2, estimate the ultimate moment capacity of the T-section using the IS:1343 regulations.

(C) Explain design Procedure for Circular Tanks.

(D) A non-cylinder prestressed concrete pipe of 1.6m dia with a core thickness of 100mm is required to withstand a working pressure of 1 N/mm^2. Determine the pitch of a 5mm dia wire winding if the high-tensile initial stress in the wire is limited to 1000N/mm^2. The permissible maximum and minimum stress in concrete are 12N/mm^2 (Compression) and zero (tension). The loss ratio is 0.8. If the direct tensile strength of concrete is 2N/mm^2, estimate the load factor against cracking.

Q.3 (A) A pretensioned beam 250mm wide and 300mm deep is prestressed by 12 wires each of 7mm diameter initially stressed to1200 N/mm^2 with their centroids located 100mm from the soffit. Estimate the final percentage loss due to elastic deformation, creep, shrinkage& relaxation using IS:1343code and following data: **(07)**

Relaxation of steel stress =90N/mm^2
Es =210kN/mm^2,
Ec =35kN/mm^2,
Creep coefficient (φ) =1.6
Residual shrinkage strain =3 x 10^{-4}

(B) An unsymmetrical I-section beam is subjected to support an imposed load of 2kN/m over a span of 8m. The sectional details are top flange, 300mm wide and 60mm thick; bottom flange, 100mm wide and 60mm thick; thickness of web=80mm; overall depth of the beam=400mm. At the central of the span, the effective prestressing force of 100KN is located at 50mm from the soffit of the beam. Estimate the stresses at the centre-of-span section of the beam for following load condition **(08)**

(a) Self-weight + prestress, and
(b) Self-weight + prestress + live load.

OR

(B) A prestressed concrete beam of rectangular section 120mm wide by 300mm deep, spans over 6m. The beam is prestressed by a straight cable carrying an effective force of 200KN at an eccentricity of 50mm. The modulus of concrete is 38kN/m^2. **(08)**

Compute the deflection at centre of span for the following
(a) Deflection under (prestress + self-weight)
(b) Find the magnitude of UDL live load which will nullify the deflection due to prestress and self-weight.

Q.4 (A) Briefly explain Composite structural Members and its with neat sketches. Also discuss its advantaged. **(07)**

OR

(A) A composite beam of rectangular section is made up of a pretensioned inverted T-beam having a slab thickness and which of 150 and 100mm, respectively. The rib size is 150m by 850mm. The cast in situ concrete has a thickness and width of 1000mm with a modulus of elasticity of 30kN/mm^2. If the differential shrinkage stress developed in the precast and situ units. **(07)**

(B) A continuous prestressed concrete beam ABC(AB=BC=10m) has a uniform rectangular cross section with a width of 100mm and depth of 300mm. The cable carrying an effective prestressing of 100mm and depth of 300mm. The cable carrying an effective prestressing force of 360kN is parallel to the axis of the beam and located at 100mm from the soffit. **(08)**

(a) Determine the secondary and resultant moment at the central support B.
(b) If the beam supports an imposed load of 1.5kN/m, calculate the resultant stresses at top and bottom of the beam at B, Assume density of concrete as 24kN/m^3.
(c) Locate the resultant line of thrust through beam AB.