Seat No: _____ **Enrollment No: _____**

PARUL UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

M.Tech. Winter 2017 - 18 Examinations

Semester: 1 **Date: 02/01/2018**

Subject Code: 03209131 **Time: 2:00pm to 4:30 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 and use IS code 1343.
4. Start new question on new page.

Q.1 **A)** What are different types of pre-stressing systems in pre-stressing concrete explain briefly with applications. **(05)**

B) Write short notes on Anchorage length and Concordant cable profile. **(05)**

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

Q.2 **Attempt any three questions.**

A) The end block of post-tensioned pre-stressed concrete beam 300mm wide and 300mm deep subjected to a concentric anchorage force of 832800N by a Fressinet anchorage of area 11720 mm^2. Design and detail the anchorage reinforcement for the end block. **(05)**

B) A rectangular concrete beam 250mm wide and 600mm deep is pre-stressed by means of four 14mm diameter high tensile bars located 200mm from the soffit of the beam. If the effective stress in the wires is 700N/mm^2 what is the maximum bending moment that can be applied to the section without causing tension at the soffit of the beam. **(05)**

C) A pre-stressed concrete beam of a section 120mm wide by 300mm deep is used over an effective span of 6m to support a uniformly distributed load of 4KN/m which includes the self weight of the beam. The beam is pre-stressed by a straight cable carrying a force of 180KN and located at an eccentricity of 50mm. Determine the resultant stresses at top and bottom of central section. **(05)**

D) A post-tensioned pre-stressed beam of rectangular section 250mm wide 580mm depth is to be designed for an imposed load of 12KN/m u.d.l on a span of 12m. The stress in the concrete must not exceed 17N/mm^2 in compression or 1.4N/mm^2 in tension at any time and loss of pre-stress may be assumed to be 15 percent. Calculate minimum pre-stressing force and corresponding eccentricity. **(05)**

Q.3 **A)** A pre-stressed concrete pile of square section 250mm wide, contains 60 pre-tensioned wires, each of 2 mm diameter, uniformly distributed over the section. The wires are initially tensioned on the pre-stressing bed with a total force of 300kN. Calculate the final stress in concrete and the percentage loss of stress after all losses, **(07)**

Relaxation of steel stress = 5% of initial stress

Es =210kN/mm^2, Ec =3kN/mm^2,Creep coefficient (φ) =1.6

Shortening due to creep=30*10-6 mm/mm per N/mm^2,

Total Shrinkage =200*10-6 per unit length.

B) A precast pre-tensioned beam of rectangular section has a width 100mm depth 200mm. the beam with an effective span of 5m is pre-stressed by tendons with their centriods coinciding with the bottom kern. The initial force in the tendons is 150KN. The loss of pre-stress may be assumed to be 15 percent. The beam is incorporated in a composite beam T beam by casting a top flange of breadth 400mm and thickness 40mm. If the composite beam supports a live load of 8KN/m^2 calculate resultant stresses developed in precast and in-situ cast concrete assuming the pre-tensioned beam as a) unsupported and b) propped during the casting of the slab. **(08)**

OR

B) A continuous pre-stressed concrete beam ABC in which AB and BC having same length 10m has dimensions 100mm width and 300mm depth. The cable carrying an effective pre-stressing force of 360 KN is parallel to axis of beam and located at 100 mm from the soffit **(08)**

a) determine the secondary and resultant moment at central support B

b) if the beam supports an live load 1.5KN/m calculate resultant stress at top and bottom of beam at B.

Q.4 A) A continuous pre-stressed concrete beam ABC (AB=BC=10m) has uniform rectangular cross-section with a width of 100mm and depth of 300mm. The cable carrying an effective pre-stressing force of 360KN is parallel to the axis of the beam and located at 100mm from the soffit **(07)**

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 stress at top and bottom of beam at B. assume density of concrete 24KN/m.

OR

A) A continuous beam ABC (AB=BC=20m) with an overall depth of 1m is pre-stressed by a continuous cable carrying a force of 300KN. The cable profile is parabolic between the supports, with zero eccentricity at the ends A and C. The cable has an eccentricity of 100mm towards the soffit at mid span sections and 200mm towards the top fiber at the mid support section. Calculate the reactions developed at the supports due to pre-stress and show the cable is concordant. **(07)**

B) A concrete beam with a cross-sectional area of 32000 mm2 and radius of gyration of 72mm is pre-stressed by a parabolic cable carrying an effective stress of 1000 N/mm^2. The span of beam is 8m. The cable, composed of 6wires of 7mm diameter has an eccentricity of 50mm at the centre and zero at the supports. Neglecting all losses find the central deflection of the beam as follows. **(08)**

1.self weight + pre-stress and

2.self-weight + pre-stress + live load of 2 KN/m.