JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- 2023

B.Tech-7th Semester (CE)

COURSE CODE (CREDITS): **18B1WCE735 (3)**   MAX. MARKS: 35

COURSE NAME: **Design of Prestressed Concrete Structures**

COURSE INSTRUCTORS: Dr. Saurav   MAX. TIME: 2

Hours

Note: (a) All questions are compulsory.

(b)Marks are indicated against each question in square brackets.

(c) The candidate is allowed to make Suitable numeric assumptions wherever required for

solving problems

Q1. Deduce an equation to find the short term deflection of a prestressed beam having parabolic cable profile upto distance L_1 from one end and there after straight tendon for distance L_2 upto center of the beam. Eccentricity at the center is "e" and at the ends are **zero.**   **[5, CO4]**

Q2. A concrete beam with a cross sectional area of 40×10^3 mm^2 and radius of gyration of 75 mm is prestressed by a parabolic cable carrying an effective prestress of 1200 N/mm^2. The span of the beam is 7m. The cable composed of 7 wires of 8 mm diameter, has an eccentricity of 50 mm at the centre and zero at supports. Neglecting all the losses find the central deflection of the beam as follows: Assume $E_b = 38$ kN/mm^2.   **[6, CO4]**

(a) Self weight + prestress

(b) Self weight + prestress + L.L. of 3 kN/m.

Q3. A rectangular concrete beam 250 mm wide and 600 mm deep is pre-stressed by means of 16 high tensile wires, each of 7 mm diameter, located at 200 mm from the bottom face of the beam at a given section. If the effective pre-stress in the wires is 700 MPa, What is the maximum sagging bending moment (in kNm) due to live load that this section of the beam can withstand without causing tensile stress at the bottom face of the beam? Neglect the effect of dead load of beam.   **[6, CO2]**

Q4. A concrete beam of span 15 m, 150 mm wide and 350 mm deep is prestressed with a parabolic cable as shown in the figure below (not drawn to the scale). Coefficient of friction for the cable is 0.35, and coefficient of wave effect is 0.0015 per meter. If the cable is tensioned from one end only, find the percentage loss in the cable force due to friction only. **[6, CO3]**

Centroidal axis

350 mm | 50 mm | 70 mm | 50 mm

7.5 m

15 m

Cable
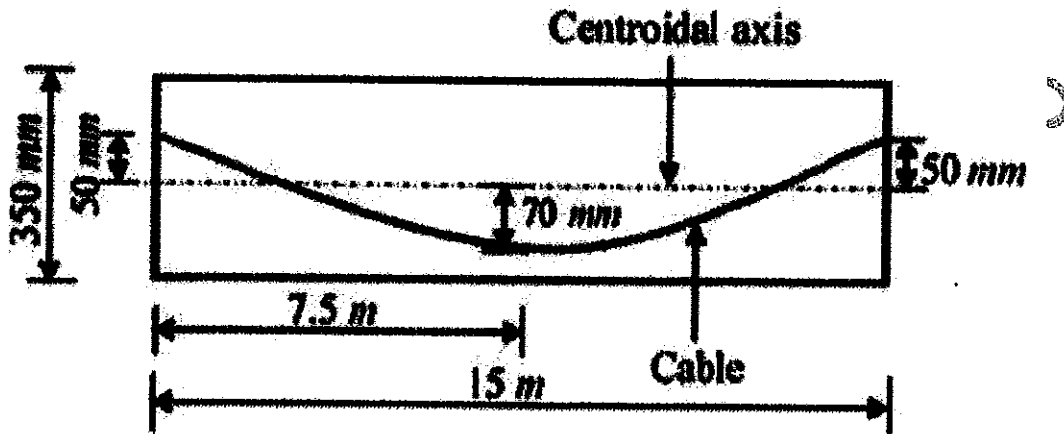
Q5. Discuss various devices used for Pretensioning and post tensioning systems. Discuss the merits and demerits of Pretensioning and post tensioning systems. **[6, CO1]**

Q6. A post-tensioned prestress concrete beam 300mm wide is to be designed for a live load of 25kN/m over a span of 15m. Permissible stress in compression is 15N/mm^2 and zero in tension. Design the beam using straight cable profile allowing 15% losses. **[6, CO2]**