JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATION- 2023

B.Tech-7th Semester (CE)

COURSE CODE (CREDITS): **18B1WCE735 (3)** MAX. MARKS: **25**

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

COURSE INSTRUCTORS: Dr. Saurav MAX. TIME: **1.5 Hour**

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. Derive an equation to find the Loss of prestress due to friction in a post tensioned member. On what factors wobble in the tendon is effected? **[5, CO3]**

Q2. A prestressed concrete beam is continuous over two spans Fig.1 and its curved tendon is to be tensioned from the two ends. Calculate percentage loss of prestress due to friction from one end to the centre of the beam. Coefficient of friction between the cable and the duct is 0.4 and the friction coefficient for wave effect is 0.0015 per meter. **[5, CO3]**

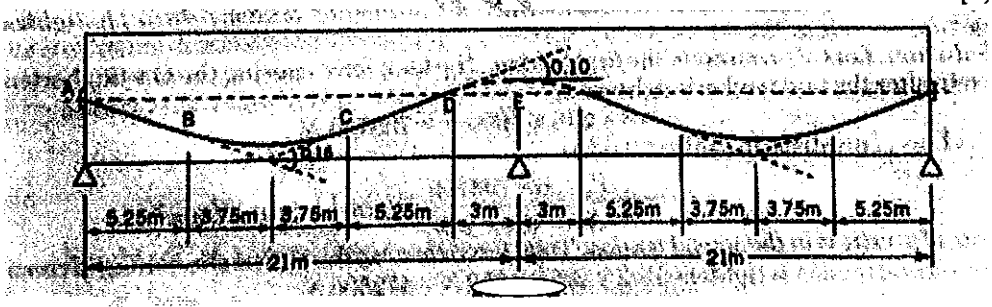

Fig. 1

Q3. A prestressed concrete beam of rectangular section 250 mm wide and 350 mm deep is provided with 12 high tension wires of 6 mm diameter located of 20 mm from the bottom of the beam and 4 similar 6 mm wires at the top located at 40 mm from the top of the beam. The wires are initially stretched to a stress of 900 N/mm^2. Determine the percentage loss of stress in the steel wires due to elastic shortening of concrete. Take $E_S = 2.10\times10^5$ N/mm^2, and $E_c = 3.50\times10^4$ N/mm^2. **[5, CO3]**

Q4. A post tensioned concrete beam of symmetrical section is 10 mm deep and has a sectional area of 2.50×10^5 mm^2. The effective span of the beam is 20 m while its actual length is 20.60 m. The prestressing force is provided by five cables each consisting of 12 wires of 5 mm

diameter. The cables are provided following a parabolic profile so that the centre of gravity of the cables may be taken to be 200 mm above the lower edge of the beam at the centre and 600 mm above the lower edge of the beam at the ends. The initial prestress after overcoming the losses due to friction and anchorage slip is 1000 N/ mm^2. Determine **[6, CO3]**

(i) The actual jacking stress required and

(ii) The effective prestress after all losses have occurred.

Take μ= 0.30

Friction coefficient for wave effect = 0.0015 per metre

Anchorage slip = 2.55 mm

Shrinkage strain = 250×10^{-6}

Creep strain = 35×10^{-6} mm/mm per N/ mm^2

Relaxation of steel stress = 4%

Modulus of elasticity for steel = 210×10^3N/mm^2

Modulus of elasticity for concrete = 30×10^3 N/mm^2

Q5. Fig 2 shows the cross section of a precast concrete slab unit for a bridge floor. Each slab unit is supported at 10 m intervals. The slab unit is subjected to a prestressing force of 375 kN applied at 45 mm from the soffit. Determine the extreme stresses in concrete for the mid span section (i) when the beam is subjected to dead load and prestressing force (i) when the beam is subjected to dead load, live load and the prestressing force. The live load on the beam is 5.75 kN/m. **[4, CO2]**

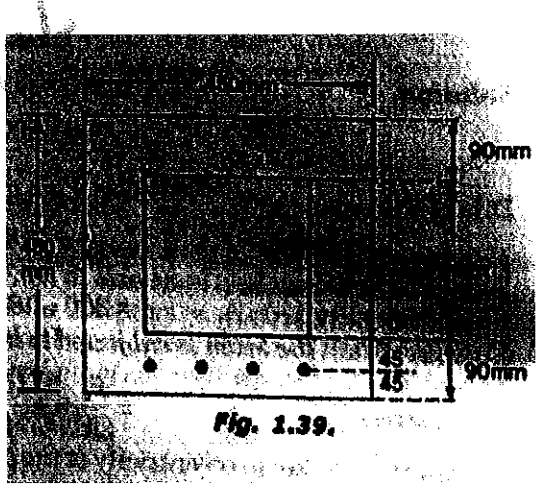

Fig. 2