JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST-3 EXAMINATION- 2023

M.Tech-II Semester (SE)

COURSE CODE (CREDITS): 12M1WCE231 (3) MAX. MARKS: 35

COURSE NAME: PRESTRESSED CONCRTE DESIGN

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

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Q1. Fig 1 shows a prestressed concrete beam of I section of span 8m. The cable carries a prestressing force of 980kN. Calculate the initial deflection at mid span due to prestress and dead load of the beam. E_c= 38kN/mm^2. State also whether this deflection is within permissible limit. Weight of the concrete may be taken as 24kN/m^3 **[5, CO4]**

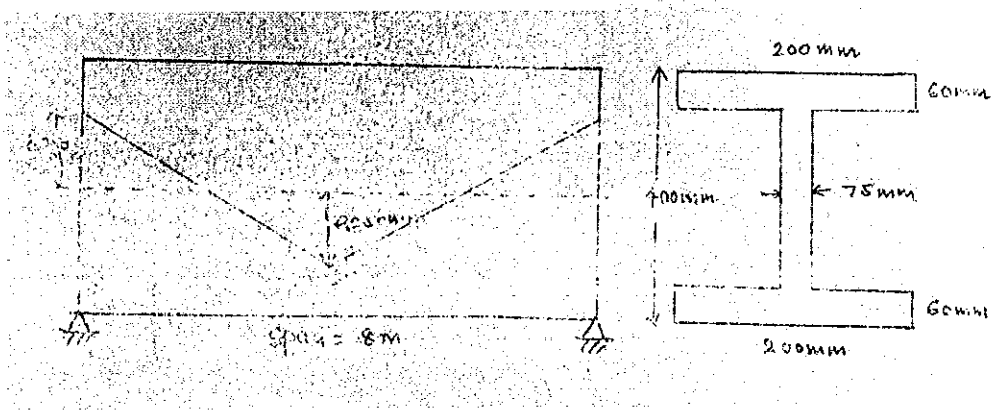

Fig. 1

Q2. A prestressed girder has to be designed to cover a span of 12m to support an uniformly distributed live load of 15kN/m. M-45 Grade concrete is used for casting the girder. The permissible stress in compression may be assumed as 14 N/mm^2 and 1.4 N/mm^2 in tension. Assume 15% losses in prestress during service load conditions. The preliminary section proposed for the girder consists of a symmetrical I-section with flanges 300 mm wide and 150 mm thick. The web is 120 mm wide by 450 mm deep. **[5, CO4]**

(a) Check the adequacy of the section provided to resist the service loads.

(b) Design the minimum prestressing force and the corresponding eccentricity for the section.

Q3. In a prestressed concrete beam of cross-section 200 mm × 300 mm and span 6 meter an initial prestressing force of 400 kN is applied at an eccentricity of 70 mm, by tendons of area 100 mm^2. Assuming $E_s = 2 \times 10^5$ N/mm^2 and $E_c = 0.333 \times 10^5$ N/mm^2 anchor slip= 1.5 mm; creep coefficient in concrete ϕ = 1, shrinkage of concrete = 0.0002 and creep loss in steel = 3 %, find the total percentage loss of stress in the tendons. **[5, CO3]**

Q4. Using a graph explain the load deflection characteristic of a Prestressed concrete members. Also explain salient points on the curve. **[2.5, CO3]**

Q5. A prestressed concrete bridge deck comprises unsymmetrical I-section beams spanning over 20 m. The cross section of a typical beam is shown in Fig 2. The beam is prestressed by seven Freyssinet cables, each carrying an effective force of 600 kN located 200 mm from the soffit at the centre-of-span section. If the total maximum bending moment at the centre of span of the girder is 3600 kNm, estimate the resultant stress developed at the mid span section **[5, CO2]**

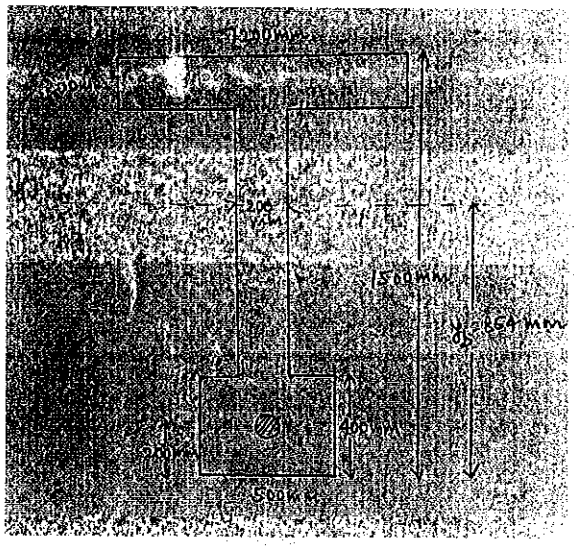

Fig. 2

Q6. An unsymmetrical I-section beam is used to support an imposed load of 3 kN/m over a span of 8 m. The sectional details are top flange, 300 mm wide and 60 mm thick; bottom flange, 180 mm wide and 60 mm thick; thickness of the web = 80 mm; overall depth of the beam = 400 mm. At the centre of the span, the effective prestressing force of 100 kN is located at 50 mm from the soffit of the beam. Estimate the stresses at the centre-of-span section of the beam for the following load conditions: **[5, CO2]**

(a) Prestress + self-weight

(b) Prestress + self-weight + live load.

Q7. Answer **any three** of the following **[7.5, CO1]**

i) Distinguish between pre tensioning and post tensioning

ii) Explain the various post tensioning systems based on wedge action with sketches

iii) Explain with sketches Hoyer's system of pre tensioning

iv) Distinguish between concentric and eccentric tendons indicating their practical applications

v) Explain the load carrying mechanics of RCC and PSC sections with sketches