JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATIONS-2022

B.Tech-XIII Semester (Civil)

COURSE CODE (CREDITS): 21B1WCE831(3) MAX. MARKS: 35

COURSE NAME: Design of Prestressed Concrete Structures

COURSE INSTRUCTORS: Dr. Saurav MAX. TIME: 2 Hours

Note: *All questions are compulsory. Marks are indicated against each question in square brackets.*

Q1. A prestressed concrete beam of rectangular section is 150mm wide and 375mm deep and is simply supported over a span of 8m. The beam is concentrically prestressed by a cable carrying an effective prestressing force of 337.5 kN. The beam supports am all inclusive load of 8kN/m. compare the principal tensile stress induced in the beam with and without prestress at the support section. [5]

Q2. A prestressed concrete beam section when subjected to a certain bending moment has a fiber stress distribution as shown in the Fig 1. The total vertical shear in concrete at the section is 2360kN. Find the principal tensile stress at the junction of the web with the lower flange and at the level of the centroidal axis. All dimensions are in mm [5]

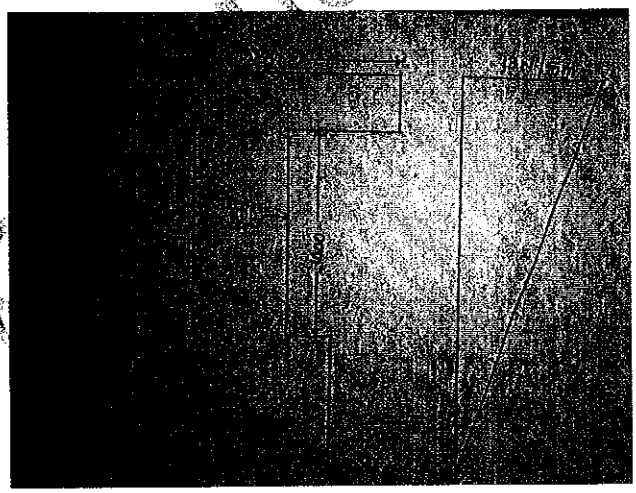

Fig. 1

Q3. A prestressed beam 240mm ×300mm is simply supported on an effective span of 6m. It is prestressed by a parabolic cable with an eccentricity of 75mm below the centroid at the mid span section and 45mm above centroid at the support section. Prestressing force is 480kN. Calculate the initial mid span deflection. Assume Live load of 4kN/m. [4]

Q4. A prestressed concrete beam of rectangular section 90mm wide and 180mm deep is to be designed to support two imposed loads of 3.5kN , each located at one third points over a span of 3m. If there is no tensile stress in the concrete at transfer and service loads calculate the minimum prestressing force and the corresponding eccentricity. Take density of concrete as 24kN/m^3. Loss is 20% [5]

Q5. Deduce the equation to calculate the short term deflection of a prestressed beam having a parabolic cable with positive eccentricity at supports and negative eccentricity at the center. [5]

Q6. A prestressed beam has a symmetrical I section in which the depth of each flange is one fifth of the overall depth and web is thin enough to be neglected in bending calculations. At the point of maximum bending moment, the prestressing force is located at the center of the bottom flange and the total loss of prestress is 20%. What must be the dead load required if there is no tensile stress in concrete at any time.

[4]

Q7. A pretensioned prestressed beam 300mm×350mm (Fig.2) to prestressed by 12 wires each 7mm diameter initially prestressed to 1500 MPa with their centroid located 120mm above the soffit of the beam. Estimate the final % loss of stress due to elastic deformation, creep, shrinkage and steel relaxation. Assume φ= 1.6 and E_c= 35 kN/mm^2 and Es= 210 kN/mm^2 [5]

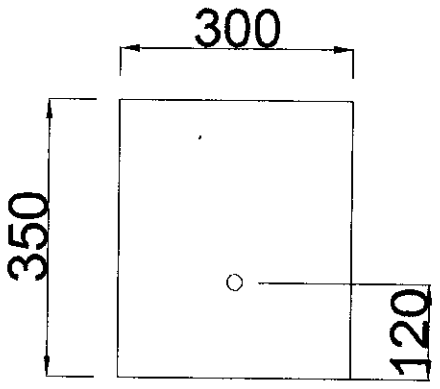

Fig. 2

Q8. Prestressed concrete has improved resistance to shearing force as compared to conventional reinforced cement concrete. Give appropriate justification for the above statement. [2]