JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -1 EXAMINATION- 2023

B.Tech-7th Semester (CE)

COURSE CODE (CREDITS): **18B1WCE735 (3)** MAX. MARKS: **15**

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

COURSE INSTRUCTORS: Dr. Saurav MAX. TIME: **1 Hour**

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***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. A beam of symmetrical I-section spanning 8 m has a flange width of 250 mm and a flange thickness of 80 mm, respectively. The overall depth of the beam is 450 mm. Thickness of the web is 80 mm. The beam is prestressed by a parabolic cable with an eccentricity of 150 mm at the centre of span and zero at supports. The live load on the beam is 2.5kN/m.

(a) Determine the effective force in the cable for balancing the dead and live loads on the beam.

b) Sketch the distribution of resultant stress at the centre-of-span section for the above case.

(c) Calculate the shift of the pressure line from the tendon-centre-line. **[4, CO1]**

Q2. A rectangular concrete beam of cross section 120 mm wide and 300 mm deep is prestressed by a straight cable carrying an effective force of 180 kN at an eccentricity of 50 mm. The beam supports an imposed load of 3.14 kN/m over a span of 6 m. If the modulus of rupture of concrete is 5 $N/mm^2$, evaluate the load factor against cracking assuming the self-weight of concrete as 24 $kN/m^3$.

**[2, CO1]**

Q3. A rectangular concrete beam 300 mm wide and 800 mm deep supports two concentrated loads of 20 kN each at the third point of a span of 9 m.

a) Suggest a suitable cable profile. If the eccentricity of the cable profile is 100 mm for the middle third portion of the beam, calculate the prestressing force required to balance the bending effect of the concentrated loads (neglect the self-weight of the beam).

(b) For the same cable profile, find the effective force in the cable if the resultant stress due to self-weight, imposed loads and prestressing force is zero at the bottom fibre of the mid-span section. (Assume Dc = 24 kN/m$^3$) **[3, CO1]**

Q4. Discuss Hoyer's Method of Pre stressing. Shear strength of a prestressed member is more than a conventional RCC member. Is this statement true? Justify **[3, CO1]**

Q5. A prestressed concrete beam of size 300mm ×600mm is 12m long. It carries a live load of 12kN/m in addition to its self weight. It is prestressed with 2000mm$^2$ high tensile steel straight cable located at 175mm from the soffit. Tabulate the location of thrust line at every 1m from the ends. Also find the result stresses at mid span section using strength concept. **[3, CO1]**