



# PRESIDENCY UNIVERSITY

BENGALURU

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## Mid - Term Examinations - March 2026

Date: 13- 03-2026

Time: 11.45am to 01.15pm

<b>School:</b> SOE	<b>Program:</b> B.Tech (Civil Engineering)		
<b>Course Code:</b> CIV3047	<b>Course Name:</b> Fundamentals of Pre-stressed Concrete Design		
<b>Semester:</b> VI	<b>Max Marks:</b> 50	<b>Weightage:</b> 25%	

CO - Levels	CO1	CO2	CO3	CO4	CO5	CO6
Marks	10	40	-	-	-	-

### Instructions:

- (i) Read all questions carefully and answer accordingly.
- (ii) Do not write anything on the question paper other than roll number.

### Part A

Answer ALL the Questions. Each question carries 2 marks.

5Q x 2M=10M

1	Define the following terms (i) partial prestressing (ii) full prestressing.	2 Marks	L1	CO1
2	List the methods of pre-stressing.	2 Marks	L1	CO1
3	Explain the need for high strength concrete and steel for PSC sections.	2 Marks	L2	CO1
4	State the expressions with the help of usual notations to calculate fibre stresses in PSC sections.	2 Marks	L1	CO1
5	Outline the disadvantages of PSC members.	2 Marks	L1	CO1

## Part B

### Answer the Questions.

**Total Marks 40M**

<b>6.</b>	<b>a.</b>	<p>A prestressed concrete beam of section 200 mm wide and 300 mm deep is used over an effective span of 6m to support an imposed load of 4kN/m. The density of concrete is 24 kN/m<sup>3</sup>. At the centre-of-span section of the beam, determine the magnitude of</p> <p>a. The concentric prestressing force necessary for zero fiber stress at the soffit when the beam is fully loaded, and</p> <p>b. The eccentric prestressing force located 100 mm from the bottom of the beam which would nullify the bottom fibre stresses due to loading.</p>	<b>10 Marks</b>	<b>L3</b>	<b>CO2</b>
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**Or**

<b>7.</b>	<b>a.</b>	<p>A rectangular concrete beam of cross section 30cm deep and 20cm wide is prestressed by means of 10 wires of 5mm diameter located 6.5cm from the bottom of the beam and 4 wires of diameter 5mm, 2.5cm from the top. Assuming the prestress in steel as 840 MPa, calculate the stresses at the extreme fibers of the mid-span section when the beam is supporting its own weight over a span of 6m. If a uniformly distributed LL of 6 kN/m is imposed, evaluate the maximum working stress in concrete. The density of concrete is 24 kN/m<sup>3</sup>.</p>	<b>10 Marks</b>	<b>L3</b>	<b>CO2</b>
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<b>8.</b>	<b>a.</b>	<p>An unsymmetrical I-section beam is used to support an imposed load of 4 kN/m over a span of 6 m. The sectional details are top flange, 300 mm wide and 80 mm thick; bottom flange, 200 mm wide and 80 mm thick; thickness of the web = 80 mm; overall depth of the beam = 450 mm. At the centre of the span, the effective prestressing force of 180 kN is located at 50 mm from the soffit of the beam. Determine the stresses at the centre of span section of the beam for the following loading conditions:</p> <p>a. Prestress + self-weight</p> <p>b. Prestress + self-weight + live load.</p>	<b>15 Marks</b>	<b>L3</b>	<b>CO2</b>
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**Or**

<b>9.</b>	<b>a.</b>	<p>A prestressed concrete beam supports a live load of 4 kN/m over a simply supported span of 8 m. The beam has an I-section with an overall depth of 400 mm. The thicknesses of the flange and web are 60 and 80 mm, respectively. The width of the flange is 200 mm. The beam is to be prestressed by an effective prestressing force of 250 kN at a suitable eccentricity such that</p>	<b>15 Marks</b>	<b>L3</b>	<b>CO2</b>
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		<p>the resultant stress at the soffit of the beam at the centre of the span is zero.</p> <p>a. Calculate the eccentricity required for the force.</p> <p>b. If the tendon is concentric, determine the magnitude of the prestressing force for the resultant stress to be zero at the bottom fibre of the central span section.</p>			
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<b>10.</b>	<b>a.</b>	<p>A prestressed concrete beam of section 150mm wide by 450 mm deep is used over an effective span of 10m to support a uniformly distributed load of 6kN/m, which includes the self-weight of beam. The beam is prestressed by a straight cable carrying a force of 200 kN and located at an eccentricity of 50mm. Determine the location of the thrust line and plot its position at one third and central span sections.</p>	<b>15 Marks</b>	<b>L3</b>	<b>CO2</b>
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**Or**

<b>11.</b>	<b>a.</b>	<p>A rectangular prestressed beam 150 mm wide and 300 mm deep is used over an effective span of 6m. The cable with zero eccentricity at the supports and linearly varying to 50 mm at the centre, carries an effective prestressing force of 400 kN. Determine the magnitude of the concentrated load Q located at the centre of the span for the following conditions:</p> <p>a. If the load counteracts the bending effect of the prestressing force (neglect self-weight of beam).</p> <p>b. If the pressure line passes through the upper kern of the section under the action of external load, self-weight, and prestress.</p>	<b>15 Marks</b>	<b>L3</b>	<b>CO2</b>
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