



PRESIDENCY UNIVERSITY

BENGALURU

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End - Term Examinations – May / June 2026

Date: 27-05-2026

Time: 01:00pm – 04:00pm

School: SOE	Program: B.Tech (Civil Engineering)	
Course Code: CIV3047	Course Name: Fundamentals of Pre-Stressed Concrete design	
Semester: VI	Max Marks: 100	Weightage: 50%

CO - Levels	C01	C02	C03	C04	C05	C06
Marks	4	4	26	22	24	20

Instructions:

- Read all questions carefully and answer accordingly.
- Do not write anything on the question paper other than roll number.
- Using the design code IS1343 is permitted.

Part A

Answer ALL the Questions. Each question carries 2marks.

10Q x 2M=20M

1.	Define the following terms (i) Partial prestressing (ii) Full prestressing.	2 Marks	L1	C01
2.	Explain hydrogen embrittlement in steel.	2 Marks	L2	C01
3.	With usual notations write the expression to calculate the location of pressure line in pre stressed concrete beam.	2 Marks	L1	C02
4.	Explain briefly internal resisting couple method.	2 Marks	L2	C02
5.	List the various types of loss of pre stress in pre tensioned concrete.	2 Marks	L1	C03
6.	With usual notations, write the expression used to calculate loss of pre stress due to elastic deformation of concrete.	2 Marks	L1	C03
7.	What are anchorage slip and friction losses in PSC members?	2 Marks	L1	C03
8.	Outline the factors influencing deflections in PSC sections.	2 Marks	L1	C04
9.	List the assumptions made in strain compatibility method of analysis of beams.	2 Marks	L1	C05
10.	Describe briefly the flexural failure of over reinforced sections.	2 Marks	L2	C05

Part B

Answer the Questions.

Total Marks 80M

11.	a.	A post tensioned concrete beam 100 mm wide and 300 mm deep, spanning over 8 m is stressed by successive tensioning and anchoring of three cables 1, 2 and 3 respectively. The cross-sectional area of each cable is 200 mm ² and the initial stress in the cable is 1000 N/mm ² . The first cable is parabolic with an eccentricity of 50mm below the centroidal axis at the center of span and 50 mm above the centroidal axis at the support sections. The second cable is parabolic with zero eccentricity at the supports and 50mm eccentricity at center. The third cable is straight with a uniform eccentricity of 50 mm below the centroidal axis. Determine the percentage loss of stress in each of the cables, if they are successively tensioned and anchored. Take $E_s = 210 \text{ kN/mm}^2$ and $E_c = 32 \text{ kN/mm}^2$.	15 Marks	L3	CO3
	b.	Explain any three types of losses in post tensioned PSC members.	5 Marks	L2	CO3
Or					
12.	a.	A prestressed concrete pile, 250x250 mm, contains 60 pre-tensioned wires, each of 2mm diameter, uniformly distributed over the section. The wires are initially tensioned on the prestressing bed with a total force of 300 kN. Calculate the final stress in concrete and the percentage loss of stress in steel after all losses, given the following data: $E_s = 210 \text{ kN/mm}^2$ and $E_c = 32 \text{ kN/mm}^2$, Creep coefficient = 1.5, Shrinkage strain = 200×10^{-6} , Relaxation of steel stress = 5% of initial stress.	20 Marks	L3	CO3
13.	a.	A prestressed concrete beam of rectangular section 120mm wide x 300mm deep, spans over 6m. The beam is prestressed by a straight cable carrying effective force of 180kN at an eccentricity of 50mm. The modulus of elasticity of concrete is 32kN/mm ² and density of concrete is 24kN/m ³ . Calculate the deflection at center of span for the following cases: i) Deflection under prestress and self-weight ii) Find the magnitude of the uniformly distributed LL which will nullify the deflection due to prestress and self-weight.	15 Marks	L3	CO4
	b.	With the help of a neat sketch, write the expression to find the deflection of PSC beams for the given tendon profiles i) Straight tendons	5 Marks	L1	CO4

		ii) Parabolic tendons			
Or					
14.	a.	The deck of prestressed concrete culvert is made up of a slab of 300 mm thick. The slab is spanning over 8 m and supports a total UDL of 30 kN/m, including DL and LL. The modulus of elasticity of concrete is 30 kN/mm ² . The concrete slab is prestressed by a straight cable each containing 12 high tensile wires of 5mm diameter stressed to 1100 N/mm ² at a constant eccentricity of 100 mm. The cables are spaced at 270 mm intervals in the transverse direction. Calculate the instantaneous deflection of the slab at center of span under prestress and the imposed loads.	15 Marks	L3	C04
	b.	Discuss the effect of tendon profile on deflection of PSC beam with parabolic tendon and central anchorage.	5 Marks	L2	C04

15.	a.	A pretensioned prestressed concrete beam having a rectangular section with a width of 150 mm and overall depth of 350 mm is prestressed by tendons of effective area 400 mm ² at an effective depth of 300 mm. Assuming a characteristic strength of concrete and steel as 40 and 1500 N/mm ² , determine the ultimate flexural strength of the section using the provisions of IS 1343 code.	15 Marks	L3	C05
	b.	List the assumptions made in the strain compatibility method of flexural analysis of PSC beams.	5 Marks	L1	C05

Or					
16.	a.	A pretensioned prestressed concrete beam having a rectangular section with a width of 150 mm and overall depth of 350 mm is prestressed by tendons of effective area 461 mm ² at an effective depth of 300 mm. Assuming a characteristic strength of concrete and steel as 40 and 1600 N/mm ² , determine the ultimate flexural strength of the section using the provisions of IS 1343 code.	15 Marks	L3	C05
	b.	Briefly discuss the types of flexural failure of PSC beams.	5 Marks	L2	C05

17.	a.	A prestressed girder of rectangular section 150mm x 300 mm deep, is to be designed to support an ultimate shear force of (V) 130 kN. The uniform prestress across section is 5 N/mm ² . Given the characteristic cube strength of concrete as 45 N/mm ² and Fe-415 HYSD bars of 8mm diameter, calculate suitable spacing for the stirrups conforming to the Indian standard code IS:1343 recommendations. Assume cover to the reinforcement as 50 mm.	20 Marks	L4	C06
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Or					
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18.	a.	A prestressed concrete beam (span = 10m) of rectangular section 120 mm wide and 300 mm deep, is axially prestressed by a cable carrying an effective force of 180 kN. The beam supports a total UDL of 5 kN/m which includes the self-weight of the member. Compare the magnitude of the principal tension developed in the beam with and without axial prestress.	20 Marks	L4	C06
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