

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER- VII EXAMINATION – SUMMER 2026

Subject Code:3170624

Date:20-05-2026

Subject Name:Design of Prestressed Concrete structures

Time:02:30 PM TO 05:00 PM

Total Marks:70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

		MARKS
Q.1	(a) Explain the terms: (1) Pretensioning (2) Tendon (3) Anchorage	03
	(b) List the various types of tensioning device used in prestressed concrete.	04
	(c) A prestressed rectangular concrete beam 200 mm wide and 600 mm deep is supporting a live load of 8kN/m over a span of 8 m. Find the effective prestressing force in the parabolic cable having an eccentricity of 80 mm at the center of span and concentric at the supports. Case 1) In this beam the bending effect of the prestressing force is nullified by the imposed load for the mid span section, neglecting self weight of the beam. Case 2) if the resultant force due to self weight, LL and prestressing force is zero at the soffit of the beam at the center of span section.	07
Q.2	(a) Explain (1) Bonded Prestressed Concrete (2) Post-tensioning (3) Degree of Prestressing.	03
	(b) Explain the concept of thrust line in PSC sections	04
	(c) Distinguish between web shear, flexural and flexure-shear cracks in concrete beam with sketches.	07
	OR	
	(c) Explain stress distribution in the end block in the prestressed concrete beam.	07
Q.3	(a) Explain the differences of prestressed concrete over reinforced concrete.	03
	(b) Explain difference between time dependent and immediate losses in prestressed concrete sections.	04
	(c) A concrete beam of rectangular section 100 mm wide and 300 mm deep is prestressed by 5 wires of 7 mm diameter located at an eccentricity of 50 mm. Initial stress in the wires are 1200 MPa. Estimate the loss of stress in steel due to creep of concrete using IS code method.	07
	OR	
Q.3	(a) Enlist the advantages of composite construction with prestressed and in situ concrete for structural members.	03
	(b) Under what situations and types of structures would you recommended the use of unbonded tendons?	04
	(c) How do you compute the loss of stress due to elastic deformation of concrete in post tensioned members with several cables which are successively tensioned? Explain in detail.	07
Q.4	(a) Post tensioned members do not suffer the loss of prestress due to elastic deformation why?	03
	(b) Enlist the formula for calculation of Moment of resistance of Flanged sections as per IS 1343 recommendations.	04

- (c) Explain the method of computing bursting tension in an end block subjected to evenly distributed forces. **07**
- OR**
- Q.4** (a) What is the need for the use of high strength concrete and tensile steel in prestressed concrete? **03**
- (b) Define transmission length and what is expression of it as per IS 1343 recommendations. **04**
- (c) A Pretensioned prestressed concrete beam of rectangular section 150 mm wide and 350 mm deep has effective cover of 50 mm. If $f_{ck} = 40\text{MPa}$, $f_p = 1600\text{MPa}$ and $A_p = 461\text{mm}^2$, Calculate ultimate flexural strength using IS code provisions. **07**
- Q.5** (a) Define the losses present in post-tensioned member. **03**
- (b) State the assumptions made in the design of prestressed concrete members for the limit state of collapse in flexure. **04**
- (c) A Pretensioned T section has a flange which is 300 mm wide and 200 mm thick. The rib is 150 mm wide by 350 mm deep. The effective depth of cross section is 500 mm. $A_p = 200\text{mm}^2$, $f_{ck} = 50\text{MPa}$ and $f_p = 1600\text{MPa}$. Estimate ultimate moment capacity of the T section using IS code method. **07**
- OR**
- Q.5** (a) Explain drying shrinkage strain and autogenous shrinkage strain. **03**
- (b) State the four fundamental conditions for stresses at transfer and service stage. **04**
- (c) What is the effect of torsion on prestressed concrete sections? How do you compute the shear stressed developed in different types of cross sections due to torque? **07**
