Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–VII (NEW) EXAMINATION – WINTER 2024

Subject Code:3170624 Date:19-11-2024

Subject Name: Design of Prestressed Concrete structures

Time:10:30 AM TO 01:00 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.**
5. **Use of IS: 1343 is permitted**.

			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 rectangular prestressed beam of 150 x 300 mm is used over an effective span of 10m. The cable is having with zero eccentricity at support and linearly varying to 50 mm at the center, carries a prestressing force of 500 kN. Find the magnitude of the concentrated load Q located at the center of the span, if the load counteracts the bending effect of the prestressing force.	**07**
Q.2	**(a)**	Define (1) Bonded Prestressed Concrete (2) Post-tensioning (3) Degree of Prestressing.	**03**
	(b)	Enlist the formula for calculating losses due to Elastic deformation and Friction in prestressed concrete sections	**04**
	(c)	Explain with sketch IS 1343 recommendations for computing the Moment of resistance of rectangular section.	**07**
		OR	
	(c)	Enlist the advantages of composite construction with prestressed and in situ concrete for structural members.	**07**
Q.3	**(a)**	Write the assumptions of Strain compatibility method.	**03**
	(b)	Explain IS 1343 recommendations for design of prestressed members subjected to bending and torsion.	**04**
	(c)	A concrete beam with a single overhang is simply supported at A and B over a span of 8 m and overhang BC is 2 m. The beam is of size 300 x 900 mm and supports a UDL of live load of 3.52 kN/m over entire span in addition to self weight. Determine the profile of prestressing cable with effective force of 500 kN which can balance dead load and live load.	**07**
		OR	
Q.3	**(a)**	Enlist the differences of prestressed concrete over reinforced concrete.	**03**
	(b)	Enlist different types of flexural failure and explain any one in detail.	**04**
	(c)	A concrete beam is prestressed by a cable with initial prestressing force of 300 kN. The cross sectional area of wires in the cable is 300 mm^2. Calculate the percentage loss of stress in the cable only due to shrinkage, if the beam is Pretensioned. Assume Es = 210 kN/mm^2.	**07**

Q.4	**(a)**	Explain transmission length, and what is expression of it as per IS 1343 recommendations.	**03**
	(b)	Explain the concept of thrust line in PSC sections	**04**
	(c)	What is effective reinforcement ratio? In what way it influence the stress in tendons and the neutral axis depth at the limit state of collapse of prestressed concrete sections?	**07**

OR

Q.4	**(a)**	Explain IS 1343 recommendations for design of prestressed members subjected to shear.	**03**
	(b)	Explain the concordant profile.	**04**
	(c)	A Pretensioned prestressed concrete beam having a rectangular section of 150 x 350 mm has an effective cover of 50 mm. If fck = 40 MPa, fp = 1600 MPa and area of prestressing steel Ap = 461 mm^2, Calculate ultimate flexural strength of section.	**07**

Q.5	**(a)**	Enlist difference between time dependent and immediate losses in prestressed concrete sections.	**03**
	(b)	Differentiate between web shear, flexural and flexure-shear cracks in concrete beam with sketches.	**04**
	(c)	A Post tensioned prestressed concrete T beam having a flange width of 1200 mm and flange thickness of 200 mm, thickness of web being 300 mm is prestressed by 2000 mm^2 at an effective depth of 1600 mm. If fck = 40 MPa, fp = 1600 MPa, Calculate ultimate flexural strength of unbounded T section assuming span/depth ratio as 20 and fpe = 1000 MPa.	**07**

OR

Q.5	**(a)**	Differentiate between Pre-tensioning and Post-tensioning.	**03**
	(b)	What is non distortional prestressing?	**04**
	(c)	Elaborate anchorage slip. How do you compute the loss of stress due to anchorage slip?	**07**

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