U.S.N.										

BM.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VT

January 2024 Semester End Main Examinations

Programme: B.E. **Semester: VII**
Branch: Civil Engineering **Duration: 3 hrs.**
Course Code: 21CV7PEPSC **Max Marks: 100**
Course: Analysis and Design of PSC Elements

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.
3. Use of IS:1343-2012 is permitted.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

		UNIT - 1	CO	PO	Marks
1	a)	Explain the need for using high tensile steel and high strength concrete in PSC members	*CO1*	*PO1*	**6**
	b)	Explain with sketches the concept of pressure line in a PSC beam	*CO1*	*PO1*	**5**
	c)	A pre stressed concrete beam is 300 mm x 600 mm in cross section. The beam is pre stressed by a force of 900 KN through a linearly varying symmetrical cable having an eccentricity of 75 mm above centroidal axis at supports and 75 mm below centroidal axis at mid span. Determine the stress distribution at transfer for the end and mid span section.	*CO1*	*PO1, PO2*	**9**
		OR			
2	a)	List out the different systems of pre stressing post-tensioned members. Explain with a neat sketch the Magnel-Blaton system of system of pre stressing.	*CO1*	*PO1*	**8**
	b)	A symmetrical I-section is used to support a live load of 3 KN/m over a span of 8m. Each flange is 300 mm wide and 60 mm thick, web is 60 mm thick and overall depth of the beam is 400 mm. At the centre of span , effective pre stressing force of 120 KN is located 50 mm from the the soffit of the beam. Find the stresses at mid span for the following cases (i) pre-stress +self weight (ii) pre- stresss+self weight +live load	*CO1*	*PO1, PO2*	**12**
		UNIT - 2			
3	a)	State and explain the different types of losses of pre-stressing in pre and post tensioned members	*CO1*	*PO1*	**6**

		b)	A post tensioned member is 12 m long and the cross section of the member is 400mm x 400 mm. It is pre stressed with 800 sq.mm of steel wires. The steel is made of four tendons with 200 sq.mm per tendon. Pre stress in the wire is1000 MPa. Determine the loss of pre stress in each tendon due to elastic shortening of concrete and the average loss of pre stress. Also find the loss of pre stress due to shrinkage of concrete, creep of concrete and due to anchorage slippage. Shrinkage strain is 0.0003 , creep coefficient C_c =2.5, m=6, anchorage slip is 3mm and E_s=200 GPa	*CO 1*	*PO1, PO2*	**14**
			UNIT -3			
	4	a)	Explain the structural behavior of PSC beam with reference to shear.	*CO2*	*PO1*	**5**
		b)	Explain the following; (i) shear stress due to torsion (ii) Direct stress due to flexure (iii) principal stresses	*CO2*	*PO1*	**6**
		c)	A simply supported beam of span 7 m is 120 mm x 220 mm in section. It is pre stressed with a parabolic cable, which carries and effective pre stress of 225 KN. The cable has maximum eccentricity of 100 mm at mid span and minimum eccentricity of 50 mm at support. Determine the principal tension at 25 mm above the centroidal fiber at a section 0.7 m from the left support. The beam carries an all-inclusive load of 12 KN/m	*CO2*	*PO1, PO2*	**9**
			OR			
	5	a)	Discuss the IS code method of computing the ultimate moment capacity of PSC members.	*CO2*	*PO1*	**5**
		b)	A rectangular post tensioned PSC girder of span 12 is to carry an imposed load of 20KN/m. Limiting the width of the beam to 300 mm, taking maximum loss of pre stress as 20%, calculate; (i) The minimum possible depth (ii) For the section provided calculate the minimum pre stressing force and the corresponding eccentricity. Assume the structure is of class -1 type and belongs to zone-1, Permissible stresses shall be as per IS 1343-2012	*CO2*	*PO2, PO3*	**15**
			UNIT -4			
	6	a)	Explain the significance of load balancing method in the design of PSC member	*CO1*	*PO1*	**5**
		b)	List the factors affecting deflection in PSC beams	*CO1*	*PO1*	**5**
		c)	A rectangular PSC beam of cross section 150 mm x 300 mm is simply supported over a span of 8m and is pre stressed by means	*CO1*	*PO1, PO2*	**10**

			of a symmetrical parabolic cable at a distance of 75 mm from the bottom of the beam at mid span and 125 mm from the top of the beam at support sections. If the force of cable is 350 KN and the modulus of elasticity of concrete is 38 KN/ mm^2, Calculate; (i) the deflection at mid span when the beam is supporting its own weight (ii) The concentrated load which must be applied at mid span to restore to the level of supports.			
			UNIT-5			
	7	a)	Explain transmission length and list the factors affecting it	*CO3*	*PO1*	**5**
		b)	Explain with neat sketches the Hoyer's effect	*CO3*	*PO1*	**5**
		c)	A Fresssyinet anchorage system of 100 mm diameter carrying 12 wires of 7 mm diameter is embedded in concrete in the web of an I –Section of web thickness 225 mm. Determine the bursting force in the end block and also design the end block as per IS1343 provisions.	*CO3*	*PO1, PO2 PO3*	**10**

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