Reg. No.													

Question Paper Code	11493

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV/DEC 2022

Seventh Semester

Civil Engineering

CE8011 - DESIGN OF PRESTRESSED CONCRETE STRUCTURES

(Regulations 2017)

(Use of IS: 1343 – 2002, IS 456 – 2000, IS 3370 (PART 1 – 4) permitted)

Duration: 3 Hours | Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

Answer ALL Questions

		Marks, K-Level, CO
1.	What are the advantages of PSC construction?	*2,K1,CO1*
2.	Define bonded and unbonded prestressing concrete.	*2,K1,CO1*
3.	Define degree of prestressing.	*2,K1,CO2*
4.	What are the stages to be considered in the design of Prestressed concrete section under flexure?	*2,K1,CO2*
5.	List the factors influencing the deflection.	*2,K1,CO3*
6.	Explain the effect of tendon profile in deflection.	*2,K1,CO3*
7.	Define propped construction in composite PSC construction.	*2,K1,CO4*
8.	List the advantages of composite prestressed concrete beams	*2,K1,CO4*
9.	Define circular prestressing.	*2,K1,CO5*
10.	Classify the tanks based on the joint.	*2,K1,CO5*

PART - B (5 × 13 = 65 Marks)

Answer ALL Questions

11.	a)	A rectangular simply supported beam 250mm X 500mm in size. Three numbers cables of 10 mm diameteris placed at an eccentricity of 150mm. The Prestress induced in the member is 300 N/ mm2. Live load acting on the member is 12kN/m. Density of concrete is 25 kN/ m^3. Compare the Prestress by (i) Stress concept, (ii) Strength concept, (iii) Load balancing concept.	*13,K3,CO1*
		OR	
	b)	Explain in detail about the basic concepts, advantages, materials required and methods of prestressing.	*13,K2,CO1*

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create

12. a) A T section is 800mm flange breadth and 100mm flanges thick. Over all depth is 600mm, web thickness is 100mm. Simply supported beam 12m span carries 10 kN/m Density of concrete is 25 kN/ m. Pre stress force is 1000 kN. Eccentricity of cable from neutral axis is 120mm. Determine extreme Pre stress and Draw stress diagram. *13,K3,CO2*

OR

b) What do you understand by Type I and Type II members? Explain in details. *13,K2,CO2*

13. a) A pretensioned T section has a flange width of 1200mm and 150mm thick. The width and depth of the rib are 300mm and 1500mm respectively. The hightension steel has an area of 4700mm2 and is located at an effective depth of1600mm. If the characteristic cube strength of the concrete and the tensile strength of steel are 40 and1600MPa respectively; Calculate the flexural strength of the T section. *13,K3,CO3*

OR

b) A Post tensioned prestressed beam of rectangular section 300mm wide is to be designed for an imposed load of 14kN/m over a span of 10m. The stress in concrete must not exceed 17N/mm^2 in compression and 1.4N/mm^2 in tension at anytime. The loss of prestress may be assumed as 18%. Calculate Minimum possible Depth of the beam, Minimum prestressing force required for the given section and the minimum eccentricity for the above prestressing force. *13,K3,CO3*

14. a) A PSC beam of 300mm wide and 400mm deep is used over an span of 8mis prestressed by a cable carrying high tensile wires of cross sectional area 2000mm^2. If the beam supports a live load of 20kN/m excluding its self weight, examine the initial deflection due to prestress, self weight and live loads for the following:
(i) Cable profile is straight with a constant eccentricity of 100mm.
(ii)Cable profile is parabolic with a dip of 100mm at the mid span and concentric at supports. AssumeEc=36kN/mm^2. *13,K3,CO4*

OR

b) A PSC beam of 150mm wide and 300mm deep is used over an span of 10mis prestressed by a straight cable carrying a force of 200kN and located at an eccentricity of 50mm. Ec=38 kN/mm^2 .Estimate the deflection at Centre span a) Underprestress + self weight, b)Find the magnitude of live load udl which will nullify the deflection due to prestress and self weight. *13,K3,CO4*

15. a) With neat sketches, explain the various cross sectional profiles adopted for PSC poles. State the general advantages of PSC poles. *13,K2,CO5*

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create

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OR

b) Examine and design a prestressed concrete pipe of internal diameter 900 mm to withstand the internal pressure of 0.8N/mm^2. The maximum permissible compressive stress in concrete is 18N/mm^2 and no tensile stress is to be permitted. Modular ratio between steel and concrete is 5.8. Adopt 5mm diameter high tensile wires which can be stressed to 1100 N/mm^2. Expected loss of prestress is 15%. *13,K3,CO5*

PART - C (1 × 15 = 15 Marks)

16. a) A cylindrical PSC water tank of diameter 3.5m and ratio of diameter to height is 4.The maximum permissible compressive stress in concrete at transfer is 14N/mm^{2}and the minimum compressive stress under working pressure is 1N/mm^2. Prestressed Wires of 5mm diameter are available for circumferential winding and Freyssinet cables made up of 12 wires of 7mm diameter. The stress in wires at transfer is 1000N/mm^2. Loss ratio is 0.75 Design the tank walls and circumferential wire winding and vertical cables for the following joint condition at the base. Sliding base (assume co efficient of friction as 0.5). *15,K3,CO6*

OR

b) Design a prestressed concrete circular water tank of radius20m and height 11m. The wall of the tank is fixed at the base and free at top. Use M55 grade concrete. The maximum allowable compressive stress in concrete at transfer is17N/mm^2. Use 8 mm diameter high tensile steel wires for circumferential prestressing and cables of 16 wires of 8 mm diameter for vertical prestressing. The effective stress in tendons can be taken as 1100 N/mm^2. The ultimate tensile strength of tendons is 1800 N/mm^2. *15,K3,CO6*