P P SAVANI UNIVERSITY

5th Semester of B. Tech. Examination

December 2022

SECV3592 Prestressed Concrete

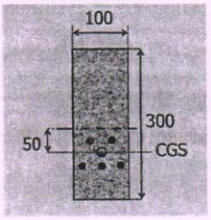
06.12.2022, Tuesday **Time: 10:00 a.m. To 12:30 p.m.** **Maximum Marks: 60**

Instructions:

1. The question paper comprises of two sections.
2. Section I and II must be attempted in separate answer sheets.
3. Make suitable assumptions and draw neat figures wherever required.
4. Use of scientific calculator is allowed.

SECTION – I

Q - 1	MCQ/Short Question/Fill in the Blanks (Any Five)	**[05]**	**CO**	**BTL**
(i)	Prestressing is possible by using Mild steel (b) High-strength deformed bars (c) High-tensile steel		**1,2,3**	**1,2,3**
(ii)	High-strength mixes should have a water/cement ratio of 0.6 to 0.8 (b) 0.3 to 0.4 (c) 0.2 to 0.3			
(iii)	Uniformly distributed load on a concrete beam can be effectively counter balanced by selecting A concentric cable (b) An eccentric cable (c) A parabolic cable			
(iv)	In case of Prestressing steels, the highest stress is reached in High-tensile strands (b) High-tensile steel bars (c) High-tensile steel wires			
(v)	Resultant stress in the cross-section of a prestressed beam comprises of (a) Prestress + dead load stress + live load stress (b) Prestress + dead load stress Prestress + live load stress			
(vi)	Loss of stress due to relaxation of steel is influenced by (a) Shrinkage of concrete (b) Friction between steel and concrete Initial stress in steel			
(vii)	Maximum permissible final deflection of a beam should not exceed Span/350 (b) Span/250 (c) Span/480			
Q - 2 (a)	What is Pre-stressing and explain the advantages of Prestressing.	**[05]**	**2**	**1**
Q - 2 (b)	Explain types of Pre-stressing.	**[05]**	**2**	**1**
	OR			
Q - 2 (a)	A concrete beam of dimension 100mm x 300mm is post-tensioned with 5 straight wires of 7mm diameter. The average prestress after short-term losses is 0.7fpk = 1200N/mm2 and the age of loading is given as 28 days. Given that Ep = 200 x 103 MPa, Ec = 35000 Mpa, find out the losses of prestress due to creep, shrinkage and relaxation. Neglect the weight of the beam in the computation of the stresses.	**[05]**	**1**	**4**

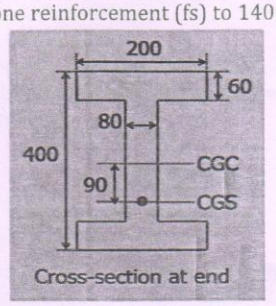


Q - 2 (b)	Explain about friction, anchorage slip in prestress.	[05]	2	2
Q - 3 (a)	A prestressed concrete beam with a rectangular section 150mm wide by 350mm deep supports a UDL of 6kN/m, which includes the self-weight of the beam. The effective span of the beam is 8m. the beam is concentrically prestressed by a cable carrying a force of 200kN. Locate the pressure line in the beam.	[10]	1	5
	OR			
Q - 3 (a)	Explain analysis of prestress beam with concentric tendon and eccentric tendon and also explain resultant stresses at a section.	[10]	1	4
Q - 4	Attempt any one/two.	[05]		
(i)	Design a post-tensioned hanger to carry an axial tension of PDL = 300 kN (dead load including self-weight) and PLL = 130 kN. The dimension of the hanger is 250 x 250 mm2. Design the section without considering non-prestressed reinforcement. Tension is not allowed under service loads. The grade of concrete is M35. The age of transfer is 28 days. Assume 15% long term losses in the prestress. The following properties of the prestressing strands are available from tests. Type of prestressing tendon: 7 wire strands Nominal diameter = 12.8mm Nominal area = 99.3 mm2 Tensile strength fpk = 1860 N/mm2 Modulus of elasticity = 195 kN/mm2		3	5
(ii)	Explain Magnel's Graphical Method with graph illustrations.		2	2

SECTION – II

Q - 1	MCQ/Short Question/Fill in the Blanks (Any Five)	[05]	1,2,3	1,2,3
(i)	In analysis of shear _____ of strain in concrete and steel is not considered.			
(ii)	_____ crack occurs close to the support of beam and propagate inclined to the beam axis.			
(iii)	The _____ deflection under service loads is due to the effective prestressing force and the gravity loads.			
(iv)	For moderate and mild environments, the limit of crack width is _____.			
(v)	The prestress is transferred over a certain length from each end of a member which is called the _____.			
(vi)	For a prismatic beam with uniform cross section along the length, the tendon profile is similar to the _____ under uniform load.			
(vii)	Typical values of span-to-depth ratios for Prestressed slab is _____.			
Q - 2 (a)	Explain different mode of failure due to shear in prestress beam.	[05]	2	2
Q - 2 (b)	Explain Design steps for the design of shear reinforcement.	[05]	2	4
	OR			
Q - 2 (a)	Explain different mode of failure due to torsion in prestress beam.	[05]	2	2
Q - 2 (b)	Explain Design steps for the beam subjected to torsion.	[05]	2	4
Q - 3 (a)	Explain about one-way prestress slab.	[05]	2	3
Q - 3 (b)	Write Short Note on prestressed concrete pipes.	[05]	2	3
	OR			
Q - 3 (a)	Explain about two-way prestress slab.	[05]	2	3

Q - 3 (b)	Design the end zone reinforcement for the pre-tensioned beam shown in the following figure. The sectional properties of the beam are as follows. $A = 46{,}400\ mm^2$, $I = 8.47 \times 108\ mm^4$, $Z = 4.23 \times 105\ mm^3$ There are 8 prestressing wires of 5 mm diameter. $Ap = 8 \times 19.6 = 157\ mm^2$ The initial prestressing $fp0 = 1280\ N/mm^2$. Limit the stress in end zone reinforcement (fs) to $140\ N/mm^2$.	**[05]**	**3**	**5**



Cross-section at end

Q - 4	Attempt any one/two.	**[05]**	**2**	**3**
(i)	Explain analysis of cantilever beams subjected to various load cases.			
(ii)	Write Short Note on prestressed ring beams.			

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CO : Course Outcome Number BTL : Blooms Taxonomy Level

Level of Bloom's Revised Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create