O.P.Code: 20CE0142	R20	H.T.No.									

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
(AUTONOMOUS)
B.Tech. IV Year I Semester Regular & Supplementary Examinations December-2024
PRESTRESSED CONCRETE
(Civil Engineering)

Time: 3 Hours **Max. Marks: 60**

(Answer all Five Units **5 x 12 = 60** Marks)

UNIT-I

1	a	Explain the necessity of using high strength concrete and high strength steel in prestressed concrete.	CO1	L2	6M
	b	With the help of neat sketch describe the Freyssinet system of prestressing.	CO1	L2	6M

OR

2		A rectangular concrete beam of cross-section 300 mm deep and 200 mm wide is prestressed by means of 15-wires of 5 mm diameter located at 65 mm from the bottom of the beam and 3-wires of 5 mm diameter at 25 mm from the top. Assuming the prestress in the steel as 840 N/mm^2, calculate the stresses at the extreme fibres of the mid-span section when the beam is supporting its own weight over a span of 6 m? If a uniformly distributed live load of 6 kN/m is imposed, evaluate the resultant stress in concrete? Take unit weight of concrete as 24 kN/m^3.	CO1	L3	12M

UNIT-II

3		A pretensioned beam 250 mm wide and 300 mm deep is prestressed by 12 wires each of 7 mm diameter initially stressed to 1200 N/mm^2 with their centroid located at 100 mm from the soffit. Estimate the final percentage loss of stress due to elastic deformation, creep, shrinkage and relaxation using IS 1343 code. Use the following data: i. Relaxation of steel stress = 90 N/mm^2 ii. E_S = 210 kN/mm^2; E_C = 35 kN/mm^2 iii. Creep co-efficient (ϕ) = 1.6 iv. Residual shrinkage strain = 3×10^{-4}.	CO2	L3	12M

OR

4		A post-tensioned cable of beam 10 m long is initially tensioned to a stress of 1000 N/mm^2 at one end. If the tendons are curved so that the slope is 1 in 24 at each end, with an area of 600 mm^2, calculate the loss of prestress due to friction given: i) Co-efficient of friction between duct and cable = 0.55 ii) Friction co-efficient for 'wave' effect = 0.0015 per 'm' iii) Es = 210 kN/mm^2 During anchoring, if there is a slip of 3 mm at the jacking end, calculate the final force in the cable and the percentage loss of prestress due to friction and slip?	CO2	L3	12M

UNIT-III

5		A cantilever portion of a prestressed concrete bridge with a rectangular cross section, 600 mm wide and 1650 mm deep is 8 m long and carries a reaction of 350 kN from the suspended span at the free end, together with a uniform distributed load of 60 kN/m inclusive of its own-weight. The beam is prestressed by seven cables each carrying a force of 1000 kN, of which three cables are located at 150 mm, three cables at 400 mm, & one at 750 mm, from top edge. Calculate the magnitude of the principal stresses at a point 550 mm from the top of cantilever at support section?	CO3	L3	12M
		OR			
6		A prestressed girder has to be designed to cover a span of 12 m, to support an uniformly distributed live load of 15 kN/m. M45 grade concrete is used for casting the girder. The permissible stress in compression may be assumed as 14 N/mm^2 and 1.4 N/mm^2 in tension. Assume 15% losses in prestress during service load conditions. The preliminary section proposed for the girder consists of a symmetrical I-section with flanges 300 mm wide and 150 mm thick. The web is 120 mm wide and 450 mm deep. i) Check the adequacy of the section provided to resist the service loads. ii)Design the minimum prestressing force and the corresponding eccentricity for the section.	CO3	L4	12M

UNIT-IV

7	a	Explain with a neat sketch in detail on the effect of tendon profile on deflection.	CO4	L2	7M
	b	State the importance of control of deflection.	CO4	L2	5M
		OR			
8		A concrete beam with a symmetrical I-section has flange width and depth of 200 mm and 60 mm respectively. The thickness of the web is 80 mm and the overall depth is 400 mm. the beam is prestressed by a cable carrying a force of 1000 kN. The span of the beam is 8 m. The centre line of the cable is 150 mm from the soffit of the beam at the centre of span, linearly varying to 250 mm at the supports. Compute the initial deflection at mid-span due to prestress and the self-weight of the beam assuming Ec = 38 kN/mm^2 ? Compare the deflection with the limiting deflection permitted in IS 1343. Take unit weight of concrete = 24 kN/m^3 .	CO4	L3	12M

UNIT-V

9	a	Explain about various types of composite construction.	CO5	L2	6M
	b	What is meant by propped & unpropped construction in composite section?	CO5	L2	6M
		OR			
10		A composite T-beam is made up of a pre-tensioned rib 100 mm wide and 200 mm deep, and a cast in-situ slab 400 mm wide and 40 mm thick having a modulus of elasticity of 28 kN/mm^2. If the differential shrinkage is 100 x 10^{-6} units, determine the shrinkage stresses developed in the pre-cast and cast in-situ units?	CO5	L3	12M

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