BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: MTECH **SEMESTER : IIND**
BRANCH: CIVIL **SESSION : SP/2025**

SUBJECT: CE547 PRE STRESSED CONCRETE

TIME: 3 Hours **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
6. IS 1343:2012/2016 is allowed in the examination hall

			CO	BL
Q.1(a)	Why high strength concrete is preferred in pre stressed concrete? Explain the type of pre stressing?	[5]	1	K1
Q.1(b)	Mention the advantages of pre stressed concrete over RCC?	[5]	1	K1
Q.2(a)	A pre tensioned PSC beam of size 150 x 300 mm is pre stressed by straight wires with an initial pre stressing force of 150 kN. The eccentricity of the wire is 60 mm. What is the percentage of stress in steel due to elastic deformation of concrete? Es = 210 kN/mm^2, Ec = 35 kN/mm^2, area of wires = 180 mm^2	[5]	2	K2
Q.2(b)	A post tensioned PSC beam of size 150 x 450 mm is pre stressed using a parabolic cable with zero eccentricity at supports and eccentricity at the centre of span is 50 mm. Initial pre stress in the cable is 1300 N/mm^2 and area of the cable is 175 mm^2. If the ultimate creep strain is 3 x 10$^{(-5)}$ and Es = 210 kN/mm^2. Find the percentage loss due to creep.	[5]	2	K2
Q.3(a)	A simply supported pre stressed rectangular beam of cross section of 350 mm x 720 mm. The beam has a uniformly distributed load of 35 kN/m over a span of 10m. The profile of tendon is parabolic with an eccentricity of 200 mm at centre and zero at supports. The pre stress force is 1750 kN. Calculate the stress at top and bottom fibres at distance of 4 m from one end. (a) By load balancing method (b) Pressure line method	[5]	3	K3
Q.3(b)	A pre tensioned, T section has a flange which is 300 mm wide and 200 mm thick. The web is 150 mm wide by 350 mm deep. The effective depth of the cross section is 500 mm. Given Ap =200 mm^2, *fck* = 50 N/mm^2 and *fp* =1660 N/mm^2. Estimate the ultimate moment capacity of the T section using the Indian Standard code regulations.	[5]	3	K3
Q.4(a)	A concrete beam with a cross sectional area of 32 x 10^3 mm^2 and radius of gyration of 72 mm is pre stressed by a parabolic cable carrying an effective stress of 1000 N/mm^2. The span of beam is 8 m. The cable, composed of 6 wires of 7 mm diameter, has as eccentricity 50 mm at the centre and zero at the supports. Neglecting all losses, find the central deflection of the beam: (a) Self weight + pre stress + Live load of 2 KN/m	[5]	4	K3
Q.4(b)	A concrete beam having a rectangular section 100 mm wide and 300 mm deep is pre stressed by a parabolic cable carrying an initial force of 240 kN. The cable has an eccentricity of 50 mm at the centre of the span and is concentric at the supports. If the span of the beam is 10 m and the live load is 2 kN/m, estimate the short term deflection at the centre of the span. Assuming E = 38 kN/mm^2 and creep coefficient Φ=2.0, loss of pre stress = 20 percentage of initial stress after 6 months. Estimate the long term deflection at the centre of span at this stage, assuming the dead and live loads are simultaneously applied after the release of pre stress.	[5]	4	K3

PTO

Q.5	A precast pre-tensioned beam of rectangular section has a breadth of 100 mm and a depth of 200 mm. The beam with an effective span of 5 m, is prestressed by tendons with their centroids coinciding with the bottom kern. The initial force in the tendons is 150 kN. The loss of prestress may be assumed to be 15 percent. The beam is incorporated in a composite T beam by casting a top flange of breadth 400 mm and thickness 40 mm. If the composite beam supports a live load of 8 kN/m^2, calculate the resultant stresses developed in the precast and in situ cast concrete assuming the pre tensioned beam as: (a) unpropped, and (b) propped during the casting of the slab. Assume the same modulus of elasticity for concrete in precast beam and in situ cast slab.	[10]	5	K3

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