

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

CLASS: BTECH
BRANCH: CIVIL

SEMESTER : VITH
SESSION : SP/2025

SUBJECT: CE414 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
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	CO	BL
Q.1(a) Mention the advantages of pre stressed concrete over RCC.	[5] 1	K1
Q.1(b) Explain the method of following pre stressing system (a) Pre Tensioning (b) Post Tensioning	[5] 1	K1
Q.2(a) A pre stressed concrete beam of section 120 mm wide by 300 mm deep is used over an effective span of 6 m to support a uniformly distributed load of 4 kN/m, which includes the self-weight of the beam. The beam is pre-stressed by a straight cable carrying a force of 180 kN and located at an eccentricity of 50 mm. Determine the location of the thrust line in the beam and plot its position at quarter and central span sections.	[5] 2	K2
Q.2(b) An unsymmetrical I section beam is used to support an imposed load of 2 kN/m over a span of 8 m. The sectional details are top flange, 300 mm wide and 60 mm thick; bottom flange 100 mm wide and 60 mm thick; thickness of the web = 80 mm; overall depth of the beam = 400 mm. The effective pre stressing force of 100 kN is located at 50 mm from the soffit of the beam. Estimate the stresses at the centre of span section of the beam for the given load condition. The profile of tendon is straight. (a) Prestress + Self -weight	[5] 2	K2
Q.3(a) A post tensioned concrete beam of rectangular section, 100 mm wide and 300 mm deep, is stressed by a parabolic cable with zero eccentricity at the supports and an eccentricity of 50 mm at the Centre of span. The area of cable is 200 mm ² and initial stress in the cable is 1200 N/mm ² . If the ultimate creep strain is 30×10^{-6} mm/mm per N/mm ² of stress and modulus of elasticity of steel is 210 KN/mm ² , compute the loss of stress in steel only due to creep of concrete.	[5] 3	K3
Q.3(b) A concrete beam of 10 m span, 100 mm wide and 300 mm deep, is prestressed by 3 cables. The area of each cable is 200 mm ² and initial stress in the cable is 1200 N/mm ² . Cable 1 is parabolic with an eccentricity of 50 mm above the centroid at the supports and 50 mm below at the centre of span. Cable 2 is also parabolic with zero eccentricity at supports and 50 mm below the centroid at the centre of the span. Cable 3 is straight with uniform eccentricity of 50 mm below the centroid. If the cables are tensioned from one end only, estimate the percentage loss of stress in each cable due to friction. Assume $\mu=0.35$ and $K= 0.0015$ per m.	[5] 3	K3
Q.4(a) A post tensioned pre stressed beam of rectangular section 250 mm wide is to be designed for an imposed load of 12 kN/m, uniformly distributed on a span of 12 m. The stress in the concrete must not exceed 17 N/mm ² in compression or 1.4 N/mm ² in tension at any time and loss of prestress may be assumed to be 15 percent. Calculate (a) The minimum possible depth of the beam (b) For the section provided, the minimum pre stressing force	[5] 4	K3

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- Q.4(b) A post tensioned beam of rectangular cross section, 200 mm wide and 400 mm deep, is 10 m long and carries an applied load of 8 kN/m, uniformly distributed on the beam. The effective pre stressing force in the cable is 500 kN. The cable is parabolic with zero eccentricity at the supports and a maximum eccentricity of 140 mm at the centre of span. [5] 4 K3
(a) Calculate the principal stresses at the supports.
- Q.5(a) Explain the effect of tendon profile on deflection? Write the formula of deflections due to self-weight and imposed load? [5] 5 K1
- Q.5(b) A concrete beam with a cross section area $32 \times 10^3 \text{ mm}^2$ 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 an eccentricity of 50 mm at the Centre and zero at the supports. Neglecting all losses, Find the central deflection of the beam as follows: [5] 5 K3
(a) Self weight + Pre stress
(b) Self weight + Pre Stress + live load of 2 kN/m.

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