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JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- 2026

M.Tech-II Semester (SE)

COURSE CODE (CREDITS): 25M11CE214 (3) MAX. MARKS: 35

COURSE NAME: PRESTRESSED CONCRETE DESIGN

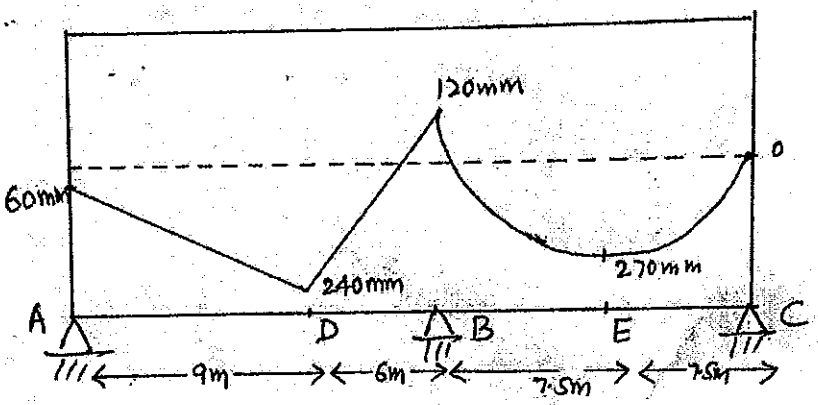
COURSE INSTRUCTORS: DR. SAURAV MAX. TIME: 2 Hours

Note: *(a) All questions are compulsory.*

(b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

(c) Use of Non programmable calculator is allowed.

Q.No	Question	CO	Marks
Q1	(a) Explain the loss of pre-stress due to friction in post-tensioned concrete members. Discuss its causes and derive the expression for calculating the loss of pre-stressing force along the tendon length. (b) A 12 m long PSC beam of 150 x 300 mm size is pre-stressed by 3 cables. The area of each cable is 200 mm2 and initial stress in the cable is 1200 N/mm2. Cable 1 is parabolic with an eccentricity of 50 mm above the centroid at the supports and 50mm below at the centre of the 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 % loss of stress in each cable due to friction by assuming and k = 0.0015 per m.	3	**5+5**
Q2	A concrete beam of rectangular beam section, 100 mm wide and 300 mm deep, is prestressed by 3 cables each carrying an effective force of 240 kN The span of the beam is 10 m. The first cable is parabolic with an eccentricity of 50 mm below the centroidal axis at the centre of span and 50 mm above the centroidal axis the supports. The second cable is parabolic with zero eccentricity at the supports and an eccentricity of 50 mm at the centre of span. The third cable is straight with an uniform eccentricity of 50 mm below the centroidal axis. If the beam supports a uniformly distributed live load of 5 kN/m and E_C = 38 kN/mm^2, estimate the resultant stresses. (a) Prestress + self weight of the beam. (b) Prestress + self weight + live load.	1	6

Q3.	Design a pre-stressed electric pole 12 m high to support wire at a stop which can exert a reversible horizontal force of 3000 N. The tendons are initially stressed to 1000 N/mm^2 and the loss of stress due to shrinkage and creep is 15%. Maximum compressive stress in concrete shall be limited to 12 N/mm^2. Take m= 6 and $\phi = 30^0$ five equal to 30°. Unit weight of soil is 18,000 N/mm^3. Draw the appropriate figure.	4	7
Q4.	A continuous pre-stressed concrete beam is shown in Fig. 1. The tendon has an eccentricity at A and is bent sharply at D and B and has a parabolic profile for the span BC. Locate the pressure line due to pre-stress alone, prestressing force is 1000 kN.  **Fig. 1**	3	7
Q5.	i. Explain the advantages of using high strength concrete and high strength steel in prestressed concrete structures. ii. Justify the need for using high tension steel instead of mild steel and high grade concrete instead of ordinary concrete in prestressed concrete structures. iii. Identify and describe the various stages of loading to be considered in the design of prestressed concrete structures.	1	5