Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SIXTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), MAY 2019

Course Code: CE368

Course Name: PRESTRESSED CONCRETE

Max. Marks: 100 Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks. Marks

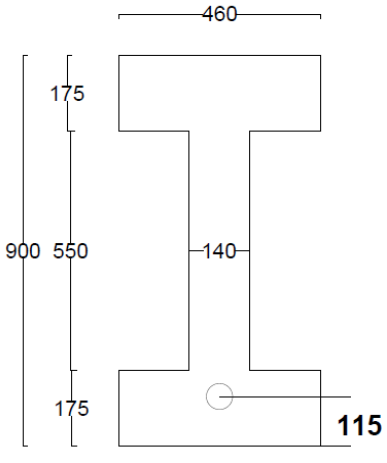
1 a) Distinguish between pre tensioned and post tensioned members. (4)

b) Explain the concept of load balancing in prestressed concrete members. (4)

c) A prestressed concrete beam of section 120 mm wide X 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 beam. The beam is prestressed by a straight cable carrying a force of 180kN and located at an eccentricity of 50 mm. Determine the location of the thrust line in the beam and plot its position at quater and central span sections. (7)

2 a) What are the serviceability limit states? Discuss the IS1343-code recommendations regarding the serviceability limit states (3)

b) A bonded post-tensioned concrete beam has a flanged cross-section as shown. It is prestressed with tendons of area 1750 mm^2 and effective prestress of 1100 $N/mm^{2.}$ The tensile strength of the tendon is 1860 N/mm^2. The grade of concrete is M60. Estimate the ultimate flexural strength of the member. (12)



Values are in mm
cross-section at mid span

3 a) Derive an expression for minimum section modulus in terms of dead and live load moments, loss ratio and range of stress. (6)

b) A pretensioned, T section has a flange which is 300 mm wide and 200 mm thick. The rib is 150 mm wide X 350 mm deep. The effective depth of cross-section is 500 mm. Given A_p = 200 mm^2, f_{ck} = 50 N/mm^2 and f_p = 1600 N/mm^2, estimate the ultimate moment capacity of the T section using Indian standard code regulations. (9)

PART B

Answer any two full questions, each carries 15 marks.

4 a) Distinguish between web shear and flexural shear cracks in concrete beam with sketches (4)

b) What is the effect of torsion in concrete ? How do you compute the shear stress developed in different types of cross sections due to torque? (4)

c) A prestressed concrete beam (span 8m) of rectangular section 150mmX330mm is prestessed by a curved cable having an eccentricity 100mm at the centre of span and reducing to zero at the supports is used, the effective force in the cable being 200kN, the beam supports a udl of 5kN/m which includes self weight of the member. Estimate the reduction in the principal tension (7)

5 a) Explain the various modes of failure encountered in prestressed concrete beams subjected to bending moment, shear and torsion (6)

b) The support section of a prestressed concrete beam,120 mm wide and 270mmdeep is required to support an ultimate shear force of 70kN. The compressive prestress at the centroidal axis is 5N/mm^2. Use fck=40N/mm^2 and characteristic tensile strength of steel in stirrups is 250N/mm^2. The cover of tension reinforcement is 50mm. Design suitable shear reinforcements at the section (9)

6 a) Distinguish clearly between short-term and long-term deflections of prestressed concrete members (3)

b) A post tensioned prestressed concrete beam of span 8m with rectangular section 300X400mm carries a prestressing force of 1000kN. If the beam supports a live load of 20kN/m excluding its selfweight,find the deflection due to prestress and liveload for the following cases. (12)

(i) The cable profile is straight and constant eccentricity of 100mm

(ii) The cable profile is parabolic with eccentricity of 100mm at midspan and concentric at supports. Assume Ec=36kN/mm^2

PART C

Answer any two full questions, each carries20 marks.

7 a) Explain the terms (i)End block and Anchorage zone and (ii)Bursting tension with reference to prestressed members (5)

b) Explain with sketches the different types of cross sections generally used for poles. (5)

c) The end block of a post tensioned PSC beam, 300mmX300mm is subjected to concentric anchorage force of 800kN by Freyssinet anchorage system of area11000mm^2. Design and detail the anchorage reinforcement for the end block. (10)

8 a) What are the different types of prestressed concrete sleepers? Mention their design considerations (10)

b) How the partial prestressing improves the behaviour of concrete structures.? Explain the terms (i) Prestressing Index (ii) Partial Prestressing Ratio (PPR) (iii) Degree of Prestress (10)

9 a) Sketch some typical cross sections of composite bridge decks with precast prestressed elements (3)

b) Explain the terms i) primary moment ii) secondary moment (iii) resultant moment iv) redundant reaction with respect to continuous prestressed concrete members (5)

c) A precast pretensioned beam of rectangular cross 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 centroid coinciding with the bottom kern. The initial force in the tendon is 150 kN. The loss of prestress may be assumed to be 15%. 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 precast and in situ cast concrete assuming the pretensioned beam as unpropped while casting the in situ slab. Assume the same modulus of elasticity for concrete in precast beam and in-situ slab. (12)