Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SIXTH SEMESTER B.TECH DEGREE EXAMINATION(S), DECEMBER 2019

Course Code: CE368

Course Name: PRESTRESSED CONCRETE

Max. Marks: 100 Duration: 3 Hours

USE OF IS CODE 1343:2012 PERMITTED

Assume any missing data suitably

PART A

Answer any two full questions, each carries 15 marks.

Marks

1 a) Explain the various types of losses of prestress in pre-tensioned and post-tensioned members. (7)

b) A pre-tensioned beam of rectangular section 400mm wide by 900mm overall depth has an effective cover of 100mm. It is prestressed by 800mm^2 of high tensile steel with characteristic tensile strength of 1600 N/mm^2. If fck = 40 N/mm^2, estimate the ultimate flexural strength (Mu) of the section. (8)

2 a) A prestressed concrete beam 300mm x 600mm, spanning over 10m carries a UDL of 6kN/m in addition to its self weight. A prestressing force of 1200 kN is applied through a straight cable at a distance of 140mm from the soffit. Evaluate the stresses at the top and bottom fibres at the mid-span cross section at Stage I (just after prestressing) . Also compute the stresses at top and bottom fibres in Stage II considering a 15% prestress loss. Take the density of concrete as 24 kN/m^3. (12)

b) Differentiate between full prestressing and partial prestressing . (3)

3 a) Design a prestressed concrete beam of rectangular cross section, M50 grade, over a span of 10 m, to support an imposed load of 15 kN/m in addition to self weight. Permisible compressive stress in concrete at transfer and service loads is 16 N/mm^2 . No tension is allowed in the member at any stage .Use high tensile steel wires of ultimate tensile strength 1600 N/mm^2, which are initially stressed to 1250 N/mm^2. Design the member as Type 1 member. Prestress loss accounts to 20%. Perform required checks. (15)

PART B

Answer any two full questions, each carries 15 marks.

4 a) Demonstrate the evaluation of ultimate shear resistance of concrete (V_c) for the conditions uncracked and cracked in flexure, as per IS Code. (8)

b) Outline the factors influencing deflection of prestressed concrete member. What (7)

are the permissible limits of deflection as per IS Code?

5 a) A prestressed concrete beam is 500mm x 800mm in cross section, M-40 grade. At a particular section, the beam is subjected to an ultimate moment 2000 kNm and a shear force of 250 kN. Design the shear reinforcement for the zone near that section with Fe 415 steel, given the section is cracked in flexure. Other data: Effective stress in tendons after all losses, f_{pe} = 900 N/mm^2, Area of prestressing steel = 2000 mm^2, tensile strength of tendons = 1500 N/mm^2, effective prestress at extreme tensile face of beam f_{pt} = 19.3 N/mm^2, effective depth = 700mm. (10)

b) Distinguish between short term and long term deflections. (5)

6 a) A concrete beam, 6m span, with a section 100mm x 200mm is prestressed by 12 wires of 7mm diameter initially stressed to 600 N/mm^2. The wires are located in a parabolic profile with an eccentricity of 50mm at the centre span and concentric at the supports. The beam supports an imposed load of 4kN/m. Modulus of elasticity of concrete = 38 kN/mm^2. Compute the initial deflection of the beam at the centre of the span under (prestress + self weight). Also estimate the long term deflection, assuming 15% loss in prestress and creep coefficient as 1.6.
Compare these deflections with the limits prescribed in IS: 1343:2012. (12)

b) Distinguish between web shear failure and flexure shear failure (3)

PART C

Answer any two full questions, each carries 20 marks.

7 a) The end block of a post tensioned prestressed member is 250mm wide and 500mm deep. Two cables, each made of 7 wires of 12 mm diameter strands, each carrying a force of 1000kN are anchored by 150mm x 150mm plate anchorages, located with their centres at 125mm from the top and bottom edges. The cable duct is of 50mm diameter. f_{ck} = 45 N/mm^2. Cube strength of concrete at transfer, f_{ci} = 25 N/mm^2. Characteristic tensile strength of steel reinforcement = 250 N/mm^2. Check for bearing stresses and calculate the bursting force. Design suitable end block reinforcements. Sketch the details. (12)

b) Distinguish between propped and un propped construction methods in composite construction using stress diagrams at various stages of construction. (8)

8 a) Why reinforcement is necessary in anchorage zone or end block? (6)

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

c) State the advantages of statically indeterminate prestressed concrete structures? (6)

9 a) A composite beam, 16m span, having a T- section formed by un propped (14)

construction technique has a top in-situ slab of 1200 mm × 200 mm over a prestressed web of 150mm width and 850mm depth. It carries only its self weight at the initial stage and a superimposed load of 23.56 kN/m at the final stage. Determine the stresses at the two stages. Initial prestressing force = 850 kN which reduces to 710kN after losses. The modulii of elasticity of in-situ and precast concretes are same.

b) What are the advantages of partially prestressed pre tensioned poles? (6)

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