Code: 15A01803 **R15**

B.Tech IV Year II Semester (R15) Regular Examinations April 2019

PRESTRESSED CONCRETE

(Civil Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

Use of IS: 1343 code may be permitted

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1 Answer the following: (10 X 02 = 20 Marks)

(a) What is the basic principle of prestressed concrete?
(b) What is pretensioning and post-tensioning?
(c) Distinguish between concentric and eccentric tendons.
(d) What is pressure line? Explain its significance.
(e) What is the loss of stress due to anchorage slip?
(f) List the types of losses in prestressed concrete beam.
(g) What type of stress blocks are adopted in Indian code specifications of flexural strength computations?
(h) What is effective reinforcement ratio?
(i) Sketch the types of shear cracks in structural concrete members.
(j) State any two factors influencing the deflection.

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 (a) Why is the high strength of concrete and high grade of steel required for prestressed concrete?
(b) Explain any two methods of prestressing system.

OR

3 (a) Write about Freyssinet system of post tensioning.
(b) What is a pressure line? Explain its significance with sketches.

UNIT – II

4 A prestressed concrete beam 200 × 300 mm deep is prestressed with wires (area = 320 mm^2) located at 50 mm from the bottom carrying an initial stress of 1000 N/mm^2. The span of the beam is 10 m. Calculate the percentage loss of prestress in wires when the beam is post-tensioned. Assume: E_S = 210 kN/mm^2
E_C = 35 kN/mm^2
Relaxation of steel stress = 5% initial stress
Shrinkage of concrete = 200×10^{-6}
Creep coefficient = 1.6
Slip at anchorage = 1 mm
Friction coefficient = 0.0015 per meter.

OR

5 A prestressed concrete beam 500 mm × 500 mm, is prestressed by 12 wires, each of 8 mm diameter. The wires are initially stressed to 1600 N/mm^2 with their centroids located 80 mm from the soffit. Calculate the final percentage loss of stress due to elastic deformation, creep, shrinkage and relaxation using given the following data:
E_S = 210 kN/mm^2 and E_C = 32 kN/mm^2
Creep coefficient = 1.6
Residual shear strain = 3×10^{-4}
Relaxation of steel stress = 90 N/mm^2.

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UNIT – III

6 Design a precast prestressed inverted T–section to be used in a composite slab of total depth 600 mm and width 300 mm. The composites slab is required to support an imposed load of 16 kN/m^2 over a span of 14 m. The compressive stress in concrete at transfer and the tensile stress under working loads may be assumed to be 20 and 1 N/mm^2 respectively. The loss ratio is 0.85. Determine the prestressing force required for the section.

OR

7 A beam is of simply supported span 8 m. The size of the beam is 350 mm × 700 mm. A prestressing force of 1000 kN was applied. The cable is parabolic with an eccentricity of 100 mm at the centre and zero at the supports. It is subjected to a u.d.l of 25 kN/m. Calculate the extreme stresses at midspan.

UNIT – IV

8 A composite beam of rectangular section is made of inverted T-beam having a slab thickness of 150 mm and width of 1000 mm. The rib size is 150 mm × 850 mm. The in situ concrete slab has E_C = 30 kN/m^2 and the thickness of cast in situ slab is 1000 mm. If the differential shrinkage in 100×10^{-6} units, estimate the shrinkage stress developed in the precast and cast in situ units.

OR

9 (a) How will you improve the shear resistance of structural concrete members by applying prestressing technique?

(b) Write the Codal provisions of bending, shear and torsion.

UNIT – V

10 A rectangular beam 250 × 500 mm in section is simply-supported over a span of 10 m. It is prestressed with a parabolic cable which has a maximum eccentricity of 200 mm at mid span and 40 mm at support sections. Effective prestressing force is 1450 kN. Concrete grade is M40. Determine the deflection due to prestress and self weight.

OR

11 A pre stressed concrete beam of rectangular section 300 mm wide by 600 mm deep, spans over 12 m. The beam is pre stressed by a straight cable carrying an effective force of 550 kN at an eccentricity of 80 mm. The modulus of elasticity of concrete is 50 kN/m^2. Compute the deflection at centre of span under prestress and self-weight.

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