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B. Tech. (Civil) (Elective-II) 6th Semester
(G Scheme) Examination, July-2022

PRE-STRESSED CONCRETE

Paper-PEC-CEEL-310-G

Time allowed : 3 hours] *[Maximum marks : 75*

Note : *(i)* ***Question No. 1 is compulsory****. Each question carries equal mark (15 marks)*

(ii) Students have to attempt ***five*** *questions in total at least* ***one*** *question from each unit.*

(iii) Use of IS-1343 is allowed.

1. Explain the following : 6×2.5=15

(i) Explain the concept of load balancing.

(ii) Distinguish between partial and fully prestressing.

(iii) Define eccentric prestressing.

(iv) State any two factors influencing the deflection.

(v) Discuss briefly the modes of failure due to shear.

(vi) Sketch the distribution of stresses in the anchorage zone.

Unit-I

2. (a) Define pre-stressed concrete. Define its advantages over reinforced concrete. 7.5

(b) Why is the high strength of concrete and high grade of steel required for prestressed concrete ? 7.5

3. (a) Explain the different types of losses of prestress in pre-tensioned members. 5

(b) A simply supported post-tensioned concrete beam of span 10 m has section 200 mm × 450 mm is subjected to an initial prestressing force of 300 kN applied at a constant eccentricity of 75 mm by tendons of 250 mm^2. Find the total loss of prestress in the tendons using the following data : $E_s = 2 \times 10^5$ N/mm^2, $E_c = 35$ kN/mm^2, anchorage slip=3mm. Creep coefficient of concrete = 1.5, shrinkage of concrete = 0.0002 and relaxation of steel = 2%. 10

Unit–II

4. How will you improve the shear resistance of structural concrete members by applying prestressing technique ? 15

5. Determine the maximum short-term and the long term deflections of a pre-tensioned concrete beam of section 250 mm × 500 mm has an effective span of 15 m. The

beam is prestressed by a parabolic cable carrying initial force of 600 kN at transfer. The cable is concentric at the supports and has an eccentricity of 150 mm at its mid-span. The beam is subjected to uniformly distributed live load of 15 kN/m in addition to two concentrated loads of 50 k/N each at quarter span points respectively. Adopt M40 grade of concrete, loss of prestress as 20%, creep coefficient is 2 and the permanent load of the transverse load is 25%. 15

Unit-III

6. A prestressed concrete pile 250 mm square, contains 60 pre-tensioned wires, each of 3mm diameter, uniformly distributed over the section. The wires are initially tensioned on the pre-stressing bed with a total force of 500 kN. Calculate the final stress in concrete and the percentage loss of stress in steel after all losses, given the following data :

$E_s = 210$ kN/mm^2 & $E_c = 32$ kN/mm^2

Shortening due to creep = 30×10^{-6} mm/mm per N/mm^2 of stress

Total shrinkage = 200×10^{-6} per unit length

Relaxation of steel stress = 5 percent of initial stress

Prestressing force, P = 400 kN 15

7. The end block of prestressed concrete is of size 120mm × 1300mm, an effective pre stressing force of 300 kN is transmitted. The distribution plate is of size 150mm wide and 150mm deep concentrically loaded at the ends. Calculate the maximum tensile force and bursting tension. Use Guyon's method. 15

Unit-IV

8. Discuss method of achieving partial persisting. Explain the design steps for partially pre stressed members. 15

9. Design a three span continuous prestressed beam of span 7m each carrying a superimposed load of 20 kN/m. Use M30 concrete., 15