Code No. : 5049

FACULTY OF ENGINEERING
B.E. 4/4 (Civil) I Semester (Main) Examination, December 2011
PRE-STRESSED CONCRETE (Elective – I)

Time : 3 Hours] [Max. Marks : 75

Note : *Answer **all** questions from Part **A**. Answer **any five** questions from Part **B**.*

PART – A **(25 Marks)**

1. Explain basic concept of prestressed concrete.
2. What are the grader of the steel used in PSC ?
3. How do you determine yield strength of H.T. Wires ?
4. How do you compute the loss of prestress due to curvature ?
5. What do you understand by "concordant" cable profile ?
6. What are the important differences between prestressed concrete and reinforced concrete ?
7. Explain the factors influencing the deflection.
8. Explain the computation of cable profiles.
9. What is Hoyer's effect ?
10. What are the different ways of improving shear resistance by prestressing techniques ?

PART – B **(50 Marks)**

11. A prestressed concrete rectangular beam 300 mm × 600 mm is prestressed with a straight force of 1500 kN applied at an eccentricity of 100 mm which finally reduces to 1200 kN. The beam carries a line load of 6 kN/m over its full span of 12m. Determine the stress distribution at mid span
    i) Under prestress + dead load
    ii) Under prestress + dead load + live load and
    iii) Under final conditions. **10**
12. Calculate the depth of a post-kusioned PSC beam 250 mm wide designed to carry a live load of 10 kN/m over a span of 12 m. The stress on concrete must not exceed 17 N/mm^2 in compression or 1.4 N/mm^2 in tension at any time. Assume losses at 15%. Calculate the minimum prestressing force and its eccentricity. **10**

13. A post tensioned beam 200 mm wide and 300 mm deep is prestressed by wires of 7 mm diameter initially stressed to 1200 N/mm^2 with their centroids located 100 mm from the soffit. Find the maximum stress in concrete immediately after transfer allowing only for elastic shortening of concrete.

    If the concrete undergoes a further shortening due to creep and shrinkage while there is a relaxation of 5 percent of steel stress estimate the final percentage of stress on the wires. Using the Indian Standard Code (IS – 1343 – 1980) regulations and following data Es = 210 kN/mm^2 ϕ = 1.6 total residual shrinkage strain = 3×10^{-4}. **10**

14. A concrete beam having a rectangular section 100 mm wide and 300 mm deep is prestressed by a parabolic cable carrying an initial force of 240 kN. The cable has a eccentricity of 50 mm at the centre and is concentric at supports. If the span in 10 m and live load is 2 kN/m. Calculate the short term deflection at mid span. Assuming E = 38 kN/mm^2 creep coefficient 2.0 and loss of prestress = 20% estimate the long time deflection at mid span. Assume that DL and LL are simultaneously applied after the release of prestress. **10**

15. Explain the advantages of stress distribution in End blocks. Write the design procedure for the Guyon's method. **10**

16. The support section of a PSC beam 100 mm wide and 250 mm deep is required to support an ultimate shear force of 120kN. The compressive prestress at the undersidal axis is 5 MPa. fck = 50 MPa, fy = 415 MPa concrete cover to shear reinforcement is 50 mm. Design suitable shear reinforcement at the section as per IS code. **10**

17. Write short notes on the following :

    i) Long term and short term deflection. **5**

    ii) Concordant cable profiles. **5**