09ENG75

Seventh Semester B.Arch. Degree Examination, Jan./Feb. 2023
Structures – VII

Time: 3 hrs.

Max. Marks:100

Note: *1. Answer any FIVE full questions.*
2. Use of IS1343-1980 and IS456-2000 is permitted.

1 a. What are the advantages of prestressed concrete over reinforced concrete? **(06 Marks)**
   b. Briefly explain the application of pre-stressed concrete. **(04 Marks)**
   c. A rectangular concrete beam 250 mm wide and 600 mm is prestressed by means of four 14 mm diameter high tensile bars located 200 mm from the soffit of the beam. If the effective stress in the wires is 700 N/mm^2, what is the maximum bending moment that can be applied to the section without causing tension at the soffit of the beam? **(10 Marks)**

2 a. Differentiate between pre-tensioning and post-tensioning. **(06 Marks)**
   b. A rectangular concrete beam 250 mm wide by 300 mm deep is prestressed by a force of 540 kN at a constant eccentricity of 60 mm. the beam supports a concentrated load of 68 kN at the centre of span of 3 m. Determine the location of the pressure line at the centre, quarter span and support sections of the beam. Neglect the self weight of the beam. **(14 Marks)**

3 a. What are loses encountered in pre-tensioning and post tensioning? **(06 Marks)**
   b. A concrete beam of 10 m span, 100 mm wide and 300 mm cable is 200 mm^2 and the initial stress in the cable is 1200 N/mm^2. Cable 1 is parabolic with an eccentricity of 50 mm above the centroid at the supports and 50 mm below at the centre of span. Cable 2 is parabolic with zero eccentricity at supports and 50 mm below the centroid at the centre of span. Cable 3 is straight with uniform eccentricity of 50 mm below the centroid. If the cables are tensioned from one end only, estimate the percentage loss of stress in each cable due to friction $\mu = 0.35$, K = 0.0015/m. **(14 Marks)**

4 a. Explain load balancing concept and pressure line in PSC. **(06 Marks)**
   b. A concrete beam post tensioned by a cable carrying as initial stress of 1000 N/mm₂. The slip at the jacking end was observed to be 5 mm. The modulus of elasticity of steel is 210N/mm₂. Estimate the percentage loss of stress due to anchorage slip if the length of the beam is,
      i) 30 m and   ii) 3 m. **(14 Marks)**

5 a. Explain types of shells with neat sketches. **(10 Marks)**
   b. Explain pneumatic structures with neat sketches. **(10 Marks)**

6 a. What is grid structures? Explain. **(10 Marks)**
   b. What are space frames? What are the advantages and applications of the same? Explain. **(10 Marks)**

7 a. Draw the plan and sectional elevation showing the details of reinforcements for a square column footing with the following data:
Column size : 600 × 600mm, column reinforcement – 12 bars of 16 mm φ, with 4 legged 8mm φ ties at 200%. Column footing – 3m × 3m. Overall depth of footing – 800mm. Footing reinforcement-20φ @ 140 c/c both ways. **(12 Marks)**

b. A simply supported R.C.C. slab is to be provided for an office floor having clear dimensions of 4m by 10 with 230mm wall all round. Draw sectional elevation showing details of reinforcements. Assume data required. **(08 Marks)**

8 Write short notes on any four of the following:
a. Pretensioning
b. Post tensioning
c. Tensile structures
d. Applications of prestressed concrete
e. Geodesic dome structures. **(20 Marks)**

* * * * *