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09ENG75

Seventh Semester B.Arch. Degree Examination, June/July 2023
Structures – VII

Time: 3 hrs.

Max. Marks:100

Note: 1. Answer any FIVE full questions.
2. Use of IS1343 and IS456-2000 is permitted.
3. Missing data, if any, may be suitably assumed.

- 1
 - a. What are the advantages of prestressed concrete? (06 Marks)
 - b. A rectangular concrete beam 100mm wide by 250mm deep spanning over 8 metres is prestressed by a straight cable carrying an effective prestressing force of 250kN, located at an eccentricity of 50mm. The beam supports a live load of 1200N/m, concrete weighs 24kN/m³.
 - i) Calculate the resultant stresses at mid section of the beam.
 - ii) If the eccentricity of the prestressing force is 40mm, calculate the prestressing force to make the final bottom stress of the beam zero. (14 Marks)
- 2
 - a. Explain "Load balancing Concept" and "Pressure line" in PSC. (08 Marks)
 - b. A rectangular concrete beam 250 mm wide by 300mm deep is prestressed by a force of 540kN at a constant eccentricity of 60mm. The beam supports a concentrated load of 68kN at the centre of span of 3m. 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. (12 Marks)
- 3
 - a. What are losses encountered in pre-tensioning and post tensioning? (06 Marks)
 - b. A concrete beam of 10 m span, 100 mm wide and 300 mm deep is prestressed by a parabolic cable of 200 mm² and the initial stress in the cable is 1200 N/mm². 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. Mention various stages of post tensioning. (03 Marks)
 - b. Distinguish between pretensioning and post tensioning. (05 Marks)
 - c. A prestressed concrete beam, 100mm wide and 300mm deep is pretensioned by straight wires carrying an initial force of 150kN at an eccentricity of 50mm. The modulus of elasticity of steel and concrete are 210 and 35kN/mm² respectively. Estimate the percentage loss of stress in steel due to elastic deformation of concrete if the area of steel wires is 188mm². (12 Marks)
- 5
 - a. What are folded plates? Explain their structural behavior. Give their field applications. (10 Marks)
 - b. What are the types of shell structures? Explain the advantages of shell roofs over conventional roofs. (10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
 2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

- 6 a. Give the detailing of typical one way slab, simply supported on the walls. Sketch the plan and cross-section. (10 Marks)
- b. Give a typical detailing of a square column supported on a square footing. Sketch the plan and cross-section. (10 Marks)
- 7 a. Explain the structural behavior of Domes and Barrel vaults. (10 Marks)
- b. Explain structural behavior and field applications of folded plates. (10 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)
