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**Seventh Semester B.Arch. Degree Examination, Dec.2019/Jan.2020**  
**Structures – VII**

Time: 3 hrs.

Max. Marks:100

**Note: 1. Answer any FIVE full questions.**  
**2. Use of IS1343 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/m<sup>3</sup>.
    - 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 the need of high strength concrete and high strength steel in prestressed concrete structures. (06 Marks)
  - b. A rectangular concrete beam of cross section 200mm wide by 300mm deep is prestressed by means of 15 wires of 5mm diameter located 65mm from the bottom of the beam and 3 wires of diameter 5mm, 25mm from the top. Assuming the prestress in the steel as 840N/mm<sup>2</sup>, Calculate the stresses at the extreme fibres of the midspan section. Live load on the beam is 6kN/m over the whole span of 6m. The density of concrete is 24kN/m<sup>3</sup>. (14 Marks)
  
- 3
  - a. Explain any three losses of prestress in pretensioning. (03 Marks)
  - b. Define thrust line or pressure line in prestressed concrete. (02 Marks)
  - c. A prestressed concrete beam with a rectangular section 120mm wide by 300 mm deep supports a udl of 4kN/n including self weight of the beam. The effective span of the beam is 6m. The beam is concentrically prestressed by a cable carrying a force of 180kN. Locate the pressure line in the beam. (15 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 carting on initial force of 150kN at an eccentricity of 50mm. The modulus of elasticity of steel and concrete are 210 and 35kN/mm<sup>2</sup> respectively. Estimate the percentage loss of stress in steel due to elastic deformation of concrete if the area of steel wires is 188mm<sup>2</sup>. (12 Marks)
  
- 5
  - a. What are the space frames? Give their advantages and applications. (10 Marks)
  - b. What are flat slabs? List advantages and disadvantages. (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 Draw plan and cross section of one way slab of internal dimension  $6\text{m} \times 2.5\text{m}$ , wall thickness = 230mm, main bar =  $12\text{mm } \phi @ 200\text{mm c/c}$ . Distribution bar =  $8\text{mm } \phi @ 250\text{mm c/c}$ . Thickness of slab = 130mm. (20 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. Tensile structures  
c. Application of prestressed concrete  
d. Doubly curved shells  
e. Load balancing concept. (20 Marks)

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