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09ENG75

Seventh Semester B.Arch. Degree Examination, July/August 2021
Structures – VII

Time: 3 hrs.

Max. Marks:100

Note: Answer any FIVE full questions.

- 1 a. What are the advantages of PSC over RCC? (06 Marks)
- b. A rectangular concrete beam 100mm wide by 250mm deep spanning over 8m is prestressed by a straight cable carrying an effective prestressing force of 250kN located at an eccentricity of 40mm. The beam support a live load of 1.2kN/m.
 - i) Calculate the resultant stress distribution for the centre of span section of the beam ($D_c = 24\text{kN/m}^3$).
 - ii) Find the magnitude of the prestressing force with an eccentricity of 40mm, which can balance the stresses due to dead and live loads at the soffit of the centre span section. (14 Marks)
- 2 a. Explain the necessity of using high strength concrete and steel in pre-stressing works. (05 Marks)
- b. A prestressed concrete beam of section 120mm wide by 300mm deep is used over an effective span of 6m to support a uniformly distributed load of 4kN/m, which includes the self-weight of the beam. The beam is prestressed by a straight cable carrying a force of 180kN and located at an eccentricity of 50mm. Determine the location of the thrust line in the beam and plot its position at quarter and central span sections. (15 Marks)
- 3 a. What are the losses encountered in pre-tensioning and post-tensioning? (06 Marks)
- b. A pretensioned concrete beam of rectangular cross section, 150mm wide and 300mm deep, is prestressed by eight high tensile wires of 7mm diameter located at 100mm from the soffit on the beam. If the wires are tensioned to a stress of 1100N/mm^2 , calculate the percentage loss of stress due to elastic deformation assuming the modulus of elasticity of concrete and steel as 31.5kN/mm^2 and 210 kN/mm^2 . (14 Marks)
- 4 A post tensioned concrete beam, 100mm wide and 300mm deep spanning over 10m is stressed by successive tensioning and anchoring of three cables 1, 2 and 3 respectively. The cross-sectional area of each cable is 200mm^2 and the initial stress in the cable is 1200N/mm^2 , $m = 6$. The first cable is parabolic with an eccentricity of 50mm below the centroidal axis at the centre of span and 50mm above the centroidal axis at the support. The second cable is parabolic with zero eccentricity at support and an eccentricity of 50mm at the centre of span. The third cable is straight with a uniform eccentricity of 50mm below the centroidal axis. Estimate the percentage loss of stress in each cable, if they are successively tensioned and anchored. (20 Marks)
- 5 a. What is Grid floor? Mention its advantages. (10 Marks)
- b. What are space frames? Mention its advantages and give their field applications. (10 Marks)
- 6 a. What is flat slab? What are its advantages and disadvantages? (10 Marks)
- b. What are Pneumatic structures? Explain their behavior. (10 Marks)

7 Draw plan and cross-section of one way slab. Internal dimensions $6\text{m} \times 2.5\text{m}$, wall 230mm, main bar = $12\text{mm } \phi @ 210\text{mm c/c}$. Distribution bar = $6\text{mm } \phi @ 240\text{mm c/c}$. Thickness of slab = 125mm. (20 Marks)

8 Write short notes on:

- a. Geodesic domes
- b. Folded plates
- c. Pre-tensioning and post-tensioning
- d. Tensile structures.

(20 Marks)

