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M. Tech. 2nd Semester (Civil Engg.) Specialization in Structural Design, Examination, May–2015

DESIGN OF STRUCTURES II

Paper–MTSD-203

Time allowed : 3 hours] *[Maximum marks : 100*

Note : *Attempt any **five** questions. At least **one** question from each unit. Assume any data if missing in the question-paper.*

1. (a) Explain why redistribution of moments is not permitted in indeterminate R.C. structures. 12

   (b) After the analysis of a continuous beam, design moments obtained are as shown : 8

   Near Supports = 500 kN-m

   Mid Span = 250 kN-m

   Obtain design moments at support and mid span after 20 percent redistribution.

2. A simply supported reinforced concrete beam of rectangular section 350 mm × 550 mm overall depth is used over an effective span of 4m. The beam is reinforced with 3 nos. 20mm dia Fe 415 at an effective depth of 500 mm. Two hanger bar of 10 mm dia are provided. The self weight together with dead load on

the beam is 5kN/m and live load is 11kN/m. Using M 25 grade of concrete and Fe 415 steel compute :

(a) Short term deflection.

(b) Long term deflection

(c) Maximum crack width at tension face directly under bar.

3. A rectangular beam 450 mm wide is subjected to a bending moment of 50 kN-m, a shear force of 30 kN and torsion of 25 kN-m. Design the section. Use M 25 concrete and Fe 415 steel. 20

4. Design an interior panel of a flat slab for a live load of 6500 N/m^2. The slab is provided with a floor finish weighting 1500 N/m^2. The panels are 6m×6m. Drops shall be provided. Use M25 grade of concrete and Fe 415 steel. 20

5. Design a suitable dog legged stair in a public building, to be located in a staircase 6m long, 3.2 m wide and 3.7m high, with a door of 1.1m wide in each of the longitudinal walls. The door faces each other and located with their centers at a distance of 0.9 m from the respective corners of the staircase. Use M20 concrete and Fe 415 steel. 20

6. Design the beam and slab type combined footings for the columns located at 4.5 m apart. The overall sizes of the columns are 400 mm × 400 mm and 600 mm ×600 mm and they are transferring 600 kN and 1000 kN respectively. The center of the lighter column is 0.4m from the property line. The safe bearing capacity of the soil is 160 kN/m^2. Use M25 concrete and FE 415 steel. Sketch the reinforcement detail. 20

7. Design an underground water tank 5m ×11m × 4m deep. The sub soil condition of sand having angle of repose of 30° and saturated unit weight of 19kN/m^3. The water table is like to raise upto ground level. Use M30 grade of concrete and HYSD bars. Take unit weight of water as 9.81kN/m^3. 20

8. An open square tank is 5m × 5m × 3 m deep and supported 6m above the ground level on beams and columns. Design the tank, supporting beams and columns. Use M 30 concrete and Fe 415 steel. 20