USN ☐☐☐☐☐☐☐☐☐☐   **10CV/CT52**

Fifth Semester B.E. Degree Examination, Dec.2016/Jan.2017
Design of RCC Structural Elements

Time: 3 hrs.   Max. Marks:100

Note: 1. *Answer FIVE full questions, selecting*
at least TWO questions from each part.
2. *Use of IS456-2000 and SP16 is permitted.*

PART – A

1   a.   What are the different loads to be considered in the design of an reinforced concrete element? **(06 Marks)**
    b.   Explain the philosophy and principles of limit state method of design. **(10 Marks)**
    c.   Explain the necessity of adopting partial safety factors for loads and material strength. **(04 Marks)**

2   a.   A single reinforced concrete beam 250×450 mm deep upto the centre of reinforcement is reinforced with 3-16 mm dia at an effective cover 50 mm, effective span 6 m, M20 concrete and Fe415 steel. Determine the central point load that can be supported in addition to the self weight. **(10 Marks)**
    b.   Determine the moment of resistance of a T-beam for the following data:
Breadth of the flange = 740 mm; Effective depth = 400 mm; Breadth of the web = 240 mm; Area of steel = 5 – 20; Depth of flange = 110 mm; Adopt M20 grade concrete and Fe415 grade steel. **(10 Marks)**

3   a.   What are the factors affecting the short term and long term deflections? **(06 Marks)**
    b.   A singly reinforced rectangular beam $360mm \times 580mm$ in section is simply supported on a effective span of 5.25 m. The steel reinforcement consists of $6\#20\phi$. The beam supports a udl of 25 kN/m (Dead load) and 28 kN/m (live load). Assume M_{20} concrete and Fe415 steel. Check the design for short and long term deflection. Take ultimate strain in concrete due to shrinkage as 0.0003 and co-efficient of creep as unity. Effective cover may be taken as 40 mm. **(14 Marks)**

4   A Tee beam slab floor of an office comprises a slab 150 mm thick spanning between ribs of 250 mm wide spaced at 3.2 m centre to centre. Clear span of beam = 7.70 m. The beam is 600 mm deep including slab and simply supported over walls of 300 mm wide. Live load on floor = 4 kN/m^2, Floor and ceiling finish = 0.75 kN/m^2. The beam also support a partition wall which transmits a load of 12 kN/m. Design one of the intermediate beam for flexure and shear. Also check for beam for deflection control. Assume effective cover = 50 mm. M20 grade and Fe415 steel. **(20 Marks)**

PART – B

5   a.   Distinguish between one way and two way slab. **(04 Marks)**
    b.   Design a two way slab for a room of internal dimensions $4m \times 5m$, supported on walls of 300 mm thickness with one corner held down. Two adjacent edges of the slab are discontinuous. Thickness of slab = 150 mm. The slab is to support a live load of 3 kN/m^2 and floor finish of 1 kN/m^2. Sketch the reinforcement details M20, Fe415 grade. **(16 Marks)**

6 a. Design a column 4 m long restrained in position and direction at both ends to carry an axial load of 1600 kN. Use M-20 grade concrete and Fe-415 grade steel. Sketch the reinforcement details. **(10 Marks)**

b. Design a R.C. column, 400 mm square, to carry an ultimate load of 1000 kN and ultimate moment of 160 kN-m. Use M20 concrete and Fe415 steel. Provide a cover of 40 mm. **(10 Marks)**

7 Design an isolated footing of uniform thickness for an RC square column, of size $500mm \times 500mm$ bearing a vertical load of 600 kN. The safe bearing capacity of the soil may be taken as 120 kN/m^2. Use M-20 grade concrete and Fe-415 grade steel. Sketch the reinforcement details. **(20 Marks)**

8 Design a dog legged stair for an office building in a room measuring $2.8m \times 5.8m$. Clear vertical distance between the floor is 3.6 m. The width of flight is to be 1.25 m. Assume imposed load of 3 kN/m^2. Use M20 concrete and Fe415 grade steel. Assume that the stairs are supported on 230 mm at the outer edges of landing slabs. Sketch the reinforcement details. **(20 Marks)**

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