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10CV/CT52

**Fifth Semester B.E. Degree Examination, June/July 2018**  
**Design of RCC Structural Elements**

Time: 3 hrs.

Max. Marks:100

**Note: Answer any FIVE full questions, selecting atleast TWO questions from each part.**

**PART – A**

- 1 a. Enlist the reasons for adopting partial safety factors for loads and material strength. (05 Marks)
- b. Briefly explain singly and doubly reinforced RCC beam. Enlist the situations where doubly reinforced RCC beam adaptation required. (05 Marks)
- c. A singly RCC beam of dimensions 230×500 mm overall, simply supported over a span of 5 m (effective). The beam consists of 4 # 16mm diameter bars in tension zone use M<sub>20</sub> and Fe-415 grade. Calculate the UDL the beam can carry. Take clear cover 25 mm. (10 Marks)
- 2 a. Explain different limit states to be considered in the design of RCC beam and derive the expression for stress block parameter. (10 Marks)
- b. Determine the moment of resistance of the T-beam having following section properties:  
Effective width of flange = 1100 mm      Thickness of flange = 110 mm  
Width of rib = 250 mm      Effective depth = 450 mm  
Area of steel = 5 # 20 mm diameter.  
Use M-25 grade concrete and Fe-415 grade steel. (10 Marks)
- 3 a. Explain short term and long term deflections. (06 Marks)
- b. A simply supported RCC beam of size 300 × 600 mm carries a udl live load of 250 kN/m and superimposed dead load 12 kN/m over an effective span of 5 m. It is reinforced with 4#16 mm diameter bars. The effective cover is 50 mm calculate the short term and long term deflection of beam  $t_{cs} = 0.003$  and creep coefficient = 1.6. (14 Marks)
- 4 Design a RCC beam of section 230 × 600mm effective span of the beam is 6m, effective cover is 50mm. Imposed load is 30 kN/m. Use M-20 grade concrete and Fe-415 grade steel. Sketch the details of reinforcement.

Strain	Stress (N/mm <sup>2</sup> )
0.00276	351.8
0.00280	360.9

(20 Marks)

**PART – B**

- 5 a. Explain briefly one way and two way slab. (04 Marks)
- b. Design a corner rectangular slab panel of size 4m × 5.5m. Assume that slab supports an imposed load of 3 kN/m<sup>2</sup> and floor finish 1 kN/m<sup>2</sup>. The slab is subjected to moderate exposure condition and is made of M-25 grade concrete, Fe-415 grade steel. Wall support is 230 mm. (16 Marks)

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- 6 a. Enlist the functions of longitudinal and lateral reinforcement in columns. (05 Marks)  
b. Design the reinforcement in a column of size 400mm × 500mm subjected to an axial load of 2000 kN. The column has unsupported length of 3.3m and is held in position at both the ends, restrained against rotation at one end. Use M-25 grade concrete and Fe-415 grade steel. (15 Marks)
- 7 Design a footing for a column of size 300mm × 300mm, carrying a load of 1200 kN. Take SBC of soil as 180 kN/m<sup>2</sup>. Use M<sub>20</sub> grade concrete and Fe-415 grade steel. Sketch the reinforcement details. (20 Marks)
- 8 Design a waist slab type dog legged staircase for an office building given the following data:  
Clear dimensions of room = 2.6 m × 4.75 m  
Height of floor = 3.2 m  
Rise = 160 mm, Tread = 250 mm  
Width of flight = 1.25 m  
Use M-20 grade concrete and Fe-415 grade steel. Landing slab spans in the same direction of the staircase. Assume wall thickness 230 mm. Take live load = 3 kN/m<sup>2</sup> and floor finish = 1 kN/m<sup>2</sup>. (20 Marks)

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