U.S.N | | | | | | | | | | |

P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Fifth Semester, B.E. - Civil Engineering

Semester End Examination; Dec. - 2019

Design of RC Structural Elements

Time: 3 hrs *Max. Marks: 100*

***Note**: Answer **FIVE** full questions, selecting **ONE** full question from each unit.*

UNIT - I

1 a. Define characteristic strength and characteristic load. 4

b. Obtain the values of stress block parameters for limit state of collapse. 6

c. A reinforced concrete beam of rectangular section 300 mm wide and 550 mm deep is reinforced with 4 bars of 16 mm diameter on the tension side with an effective cover of 50 mm. The beam is simply supported over an effective span of 5 m. Find the maximum uniformly distributed load the beam can carry. Use M20 concrete and Fe500 steel. 10

2 a. Discuss balanced, under reinforced and over reinforced sections with the help of diagram. 5

b. Obtain an expression for limiting depth of natural axis, limiting percentage of steel and limiting moment of resistance for a rectangular beam with M25 concrete and Fe 500 steel. 5

c. Design a simply supported reinforced concrete rectangular beam of 300 mm wide and 600 mm deep of effective span 5.5 m to carry a factored load of 100 kN/m (inclusive of its self weight). Effective cover to reinforcement is to be taken as 50 mm. Use M20 concrete and Fe 415 steel. 10

UNIT - II

3 a. Write a note on effective width of flange. 5

b. A 5 m reinforced concrete simply supported slab of thickness 125 mm, ribs below the slab are 300 mm wide 375 mm deep and placed at 4 m centre to centre. The slab and beam are casted to act together. Determine the reinforcement required for the intermediate Tee beam to carry a live load of 3 kN/m^2, floor finish of 0.75 kN/m^2 and ceiling finish of 0.35 kN/m^2. Assume M25 concrete and Fe500 steel. 15

4 a. Briefly explain the different types of shear reinforcement provided in reinforced concrete sections. 5

b. A simply supported beam of 300 mm wide and effective depth of 550 mm carries a uniformly distributed load of 67.5 kN/m (inclusive of its self weight) over an effective span of 5 m. The reinforcement consists of 4 bars of 25 mm diameter bars. Out of these 2 bars are bent up at 1m from support. Assume M25 concrete and Fe45 steel. Design the shear reinforcement in the beam. Sketch the details of reinforcement along and across the section. 15

Contd….2

UNIT - III

5. Design a simply supported rectangular beam for a clear span of 6 m carrying an imposed load of 22 kN/m. The beam rests on wall of width 230 mm. Use M25 concrete and Fe500 steel. Apply necessary checks. Sketch the details of reinforcement. 20

6. Design a cantilever beam of span 1.5 m projecting from column of 230 mm width. The live load on the beam is 25 kN/m. Use M20 concrete and Fe415 steel. Apply necessary checks. Sketch the details of reinforcement. 20

UNIT - IV

7. Design an interior panel of two way slab. The size of the panel 3 m × 5 m (clear dimensions) and is supported over 230 mm wall around. Assume live load of 3 kN/m^2. Floor finish 0.75 kN/m^2. Ceiling finish 0.5 kN/m^2. Use M20 concrete and Fe415 steel. Apply necessary checks. Sketch the details of reinforcement. 20

8. Design a dog legged staircase for an office building in a room measuring 3 m × 6 m (clear dimensions). Floor to floor height is 3.5 m. The building is a public building liable to overcrowding. Stairs are supported on brick walls 230 mm thick at the end of landings. Use M20 concrete and Fe415 steel. Sketch the details of reinforcement. 20

UNIT - V

9. Design a rectangular column and 4.6 m long restrained in position and direction at both ends to carry an axial load of 1500 kN. Use M20 concrete and Fe415 steel. Sketch the details of reinforcement. 20

10. Design a rectangular footing of uniform thickness for an axially loaded column of size 300 mm × 600 mm. Load on column is 1150 kN. Consider safe bearing capacity of soil as 200 kN/m^2. Use M20 concrete and Fe415 steel. Sketch the details of reinforcement. 20

* * *