16AG1A0102

**R16**

Code No: 135AJ

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**B. Tech III Year I Semester Examinations, November/December - 2018**

**DESIGN OF REINFORCED CONCRETE STRUCTURES**

**(Common to CE, CEE)**

**Time: 3 hours** **Max. Marks: 75**

**Note:** This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

**PART - A**

**(25 Marks)**

1.a) Distinguish between singly reinforced and doubly reinforced beams. [2]
b) Distinguish between balanced section, under reinforced section and over reinforced section. [3]
c) List the various shear failures of beams. [2]
d) Define bond stress and anchorage. [3]
e) Distinguish between circular columns with helical steel and circular columns with hoop steel. [2]
f) List the uses of Pu-Mu charts in the design of columns. [3]
g) Tell how will you decide the size of footing? [2]
h) Differentiate between isolated and combined tooling. [3]
i) Distinguish between one way slab and two way slab. [2]
j) Describe briefly about torsion reinforcement in slabs. [3]

**PART – B**

**(50 Marks)**

2. Describe stress block as per limit state method? Derive stress block parameters from the first principles. [10]

**OR**

3.a) A doubly reinforced section is 250mm wide and 500mm deep to the centre of tensile reinforcement. It is reinforced with 2bars of 16mm diameter as compression reinforcement at an effective cover of 50mm and 4bars of 25mm diameter as tensile reinforcement. Calculate the ultimate moment of resistance of the beam section.
b) Find the area of steel and moment of resistance for the given data of a T-Beam when M20 Concrete and Fe415 grade steel are used. Flange width: 1200mm, Flange thickness: 80mm, effective depth: 500mm, rib width: 250mm. Consider the section as balanced section. [10]

4. A R.C Beam 300mm × 450mm is reinforced with 3bars of 20 mm diameter with an effective cover of 50mm in tension zone. The ultimate shear at the section is 210kN. Design the shear reinforcement. Use M20 concrete and Fe415 steel. Sketch the reinforcement details. [10]

**OR**

5. List the steps involved in the design of CANOPY. [10]

6. An R C rectangular column of size 250mm × 300mm is reinforced with 4 bars of 20mm ϕ provided one at each corner with an effective cover of 60mm. Examine the safety of the column if it is subjected to $P_u$=300kN. $M_{ux}$=30kNm, $M_{uy}$=20kNm. Assume M20 concrete and Fe415 grade steel. [10]

**OR**

7. Design a short helically reinforced column of unsupported length 3.6m to carry an axial service load of 1200kN. Use M25 concrete and Fe415 steel. Sketch the reinforcement details. [10]

8. Design an isolated square footing for a column of size 300 mm × 300 mm carrying a factored axial load of 800kN. Safe bearing capacity of the soil is 100kN/m$^2$. Use M25 Concrete and Fe415 grade steel. [10]

**OR**

9. Design an isolated circular footing for a column of size 300 mm diameters carrying a factored axial load of 700kN. Safe bearing capacity of the soil is 100kN/m$^2$. Use M20 Concrete and Fe415 grade steel. [10]

10. Design a slab for room of size 5m × 6m supported on 300mm thick masonry walls all around. The corners are held down. The Live load is 2.5kN/m$^2$. Use M20 concrete and Fe415 steel. [10]

**CR**

11. Design a stair case for an office building to be located in a room measuring 3.5m×5.5m. The vertical distance between floors is 3.8m. The Live load can be assumed as 4kN/m$^2$. Use M20 concrete and Fe415 steel. Take Rise as 150mm and Tread as 300mm. [10]

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