R16

Code No: 135AJ

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year I Semester Examinations, December - 2019

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 as sub questions.

PART – A

(25 Marks)

1.a) What is equivalent flange thickness for analysis and design of T beams? [2]

b) What is the significance of partial safety factors for load and material strength in limit state method of design? [3]

c) Tell the reason for providing minimum shear reinforcement in the form of stirrups. [2]

d) What is equivalent shear as specified in IS456 for members subjected to torsion and shear? [3]

e) List the methods recommend by IS 456 to estimate the effective length of columns. [2]

f) What are the functions of longitudinal and transverse reinforcement in columns? [3]

g) Show the expression to calculate the depth of foundation by Rankine's formula. [2]

h) List any two situations in which combined footings are preferred to isolated footings. [3]

i) Explain the phenomenon of lifting of corners in two-way slab. [2]

j) What is the function of providing distribution steel in slab? [3]

PART – B

(50 Marks)

2.a) A singly reinforced rectangular beam with width 230 mm and effective depth 450 mm is reinforced with 5 bars of 16 mm diameter. Determine the ultimate moment of resistance of the section using limit state method. Grade of concrete M 20 and steel Fe 500.

b) Develop the expression for ultimate moment of resistance in a singly reinforced T-beam having NA within the flange and when NA lies at the bottom of the flange. [5+5]

OR

3.a) Determine the ultimate moment of resistance of a T beam section using Fe 415 grade steel and M20 concrete grade. Width of flange = 800 mm, Depth of slab = 80 mm, Width of rib = 300 mm, Area of steel = 4-20 mm ϕ on tension side

b) Explain the under, over and balanced section with respect to limit state method of RC design. [5+5]

1.a) Discuss the torque-twist relationship for (i) plain concrete, and (ii) reinforced concrete members subjected to pure torsion.

b) Determine the development length in compression for the given data: Diameter of a steel bar is 20 mm, Fe 415 steel and design bond stress is 1.2 MPa for plain bars in tension. [5+5]

OR

5.a) A Simply supported beam 300 mm × 600 mm (effective) is reinforced with 5 bars of 25 mm diameter. It carries a uniformly distributed load of 80 kN/m (Including self-weight) over an effective span of 6m. Out of 5 main bars, two bars can be bent-up safely near the supports. Design the shear reinforcement for the beam. Use M20 grade of concrete and Fe 415 steel.

b) The provision of minimum stirrup reinforcement is mandatory in all reinforced concrete beams. Elaborate. [5+5]

6.a) Design a bi-axially eccentricity loaded braced circular column deforming in single curvature for the following data:
Ultimate load=200kN, Ultimate moment in longer direction at bottom M_{ux1}=178 kN-m and at top M_{ux1}= 128 kN-m. Ultimate moment in shorter direction at bottom M_{uy1}= 108 kN-m and at top M_{uy2}= 88 kN-m. Unsupported length of column = 9m. Effective length in long direction l_{ex}=8m. Effective length in shorter direction l_{ey}= 5.8m. Diameter of column = 550mm. Use M25 and Fe415.

b) Discuss various assumptions used in the limit state method for design of compression members. [5+5]

OR

7.a) Design the reinforcement in short column 400 × 600 mm subjected to an ultimate axial load of 1600kN together with ultimate moments of 120 kN-m and 90 kN-m about the major and minor axis respectively. Use M20 grade concrete and Fe415 grade steel.

b) Explain the "balanced failure", "compression failure" and "tension failure" of a short column subjected to axial load and uniaxial moment. [5+5]

8.a) Two columns, A and B, carry the loads of 600 kN and 700 kN respectively, are spaced at 3 m c/c. Design combine footing for the columns if SBC of the soil is 180 kN/sq.m. Use M 20 and Fe 500.

b) List design steps for Isolated rectangular column footing. [5+5]

OR

9.a) Design and detail isolated footing for an axially loaded column 400 × 400 mm in c/s and carrying 1500 kN working load. Take SBC of soil as 200 kN/m^2.

b) Sketch reinforcement detail of a rectangular combined footing to be provided for two columns. Sketch plan, longitudinal and cross section. [5+5]

10.a) The passage 2.75 m wide is supported on 230 mm thick side walls. It carries superimposed loads of 3.75 kN/sq. m. including floor finish. Design a suitable one way slab using M20 concrete and Fe415 steel. Take MF=1.4. Sketch the c/s of slab along shorter span showing reinforcement details (Checks not required).

b) Sketch the standard detailing of the two span one way continuous slab with curtailment details. [5+5]

OR

11.a) An open terrace 5 m wide is supported on 300 mm thick side wall. It carries superimposed load of 3.5 kN/m including floor finish. Design one way slab using concrete M20 and Fe415 grade. Take M. F. = 1.4. Sketch cross-section of slab along shorter span showing reinforcement details. (Shear and deflection checks are not necessary)

b) Design an interior panel of RC slab 3m × 6m size, supported by wall of 300mm thick. Live load on the slab is 2.5kN/m². the slab carries 100mm thick lime concrete (density 19kN/m²).Use M15 concrete and Fe 415 steel. [5+5]

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