

R16

Code No: 135AJ

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year I Semester Examinations, July/August - 2023

DESIGN OF REINFORCED CONCRETE STRUCTURES

(Civil Engineering)

Time: 3 Hours

Max. Marks: 75

Note: i) Question paper consists of Part A, Part B.

ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.

iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

iv) **Use of IS 456 and only design charts for columns from SP-16 re allowed.**

PART – A

(25 Marks)

- 1.a) Differentiate between working stress method and limit state method. [2]
- b) Give the idealized stress-strain curve for the concrete and steel. [3]
- c) When do we require splicing in steel reinforcement? [2]
- d) State the spacing of shear reinforcement as per IS 456:2000. [3]
- e) What is the slenderness ratio? Explain. [2]
- f) What are the assumptions for limit state design of columns failing in pure compression as given in IS: 456-2000? [3]
- g) Explain the minimum cover required for the footing. [2]
- h) What are the situations in which combined footing are preferred to isolated footing? [3]
- i) What is the Reinforcement requirement for Two-way slabs as per IS: 456? [2]
- j) Write three general features of the two-way slab. [3]

PART – B

(50 Marks)

- 2.a) Enumerate the five limit states commonly used in limit state design and state briefly how they are provided in the design.
- b) Explain the terms balanced, over-reinforced and under-reinforced section in bending. Explain which of these should be recommended in design. [5+5]

OR

- 3.a) Find the moment resistance of a singly reinforced concrete beam of 200 mm width and 400 mm effective depth, reinforced with 4 bars of 16 mm dia. of Fe 415 steel. Take M20 concrete.
- b) Draw the singly reinforced rectangular beam cross-section and show the strain and stress diagrams. [5+5]
4. Design for Torsion. Determine the reinforcement required for a rectangular beam section with the following data:
Width of section: 300 mm
Depth of section: 500 mm
Factored B.M: 65 kN-m.
Factored torsional moment: 40 kN-m.
Factored shear force: 70 kN.
Use M 15 grade concrete and Fe 415 grade steel. [10]

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OR

5. A doubly reinforced beam of rectangular section 250 mm wide by 5 mm overall depth is reinforced with 4 bars of 22 mm diameter on the tension face and 2 bars of 16 mm diameter at the compression face. The effective cover is 50 mm. The beam spans over 8 m. If Fe-415 HYSD bars are used, check for the deflection control using the empirical method. [10]

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6. Design a column of unsupported length 3m to carry an axial load of 2000 kN and a BM of 150kNm at service conditions. Design the column as a short column. The column is subjected to severe exposure condition and grade of steel is Fe500. Provide equal reinforcement on all the faces. Use M30 concrete. Sketch the reinforcement details. [10]

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OR

- 7.a) Write the design procedure for slender columns for both braced and unbraced column.
b) Outline the procedure for design of axially loaded reinforced concrete column. [5+5]

8. Design a combined rectangular footing with central joining beam two columns 400 mm × 400 mm in section carry a load of 1000 kN each inclusive of the self-weight. Design a combined footing having central beam joining the columns. The c/c spacing of the columns is 4 m. The safe bearing capacity of soil is 150 kN/m². Use M20 grade concrete and Fe 415 steel. [10]

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OR

- 9.a) What are the Indian standard code recommendations for design of footings as per S: 456-2000?
b) Design a rectangular isolated sloped footing for a column of size 250 mm × 750 mm carrying an axial load of 2600 kN. The safe bearing capacity of the soil is 300 kN/m². Use M 30 grade concrete and Fe 500 grade steel. [5+5]

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10. Design continuous RC slab for a 7 m wide and 14 m long classroom. The slab is supported on RCC beams spaced at 3.5 m intervals. The width of each beam is 230mm. Design the slab for a Live Load (LL) of 3KN/m² Assume the weight of roof finishing as 1 KN/m². Use M20 grade concrete and Fe 500 grade steel. [10]

OR

11. Design a dog- legged stair for a building in which the vertical distance between floors is 3.6 m. The stair hall measures 2.5 m × 5m. The live load may be taken as 2500 N/m². Use M 20 concrete and Fe415 steel bars. [10]

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