

7425

BOARD DIPLOMA EXAMINATION, (C-20)

MAY—2023

DCE - FOURTH SEMESTER EXAMINATION

DESIGN AND DETAILING OF RC STRUCTURES

Time : 3 Hours ]

[ Total Marks : 80

**PART—A**

3×10=30

- Instructions :** (1) Answer **all** questions.  
(2) Each question carries **three** marks.  
(3) Assume suitable data, if necessary.  
(4) IS 456 : 2000 code and SP-16 are allowed with candidates.  
(5) Answers should be brief and straight to the point and shall not exceed five simple sentences.

1. Define modular ratio. Write the equation for modular ratio in working stress method.
2. State the loads to be considered in the design of reinforced concrete structures.
- \* 3. Define limit state and state different types of limit states.
4. State any three differences between limit state design and working stress design.
5. Sketch the stress and strain diagrams for a singly reinforced rectangular beam and indicate the values of stress and strain.
6. Calculate the spacing of two-legged 8 mm diameter stirrups as per minimum shear reinforcement for a beam 350 mm wide 500 mm overall depth. Use Fe 415 bars.

7. Write any three differences between one-way slab and two-way slab.

8. Find the effective flange width for a simply supported T-beam with the following data :
- Effective span is 5 m
- Center to center distance of adjacent panels is 4 m
- Width of web is 300 mm
- Thickness of slab is 110 mm
9. Write the bending moment coefficients for a three span continuous beam at next to end support and interior support.
10. Write IS code provisions for pitch and diameter in columns of lateral reinforcement.

**PART—B**

8×5=40

- Instructions :** (1) Answer **all** questions.
- (2) Each question carries **eight** marks.
- (3) Assume missing data, If any suitably, IS 456 : 2000 code and SP-16 are allowed with candidates.
- (4) Answers should be comprehensive and criterion for valuation is the content but not the length of the answer.

11. (a) Design a rectangular simply supported reinforced concrete beam over a clear span of 5 m. The superimposed load is 25 kN/m and support width is 230 mm each. Use M 20 concrete and Fe 415 steel. Check the design for deflection. Shear reinforcement design is not necessary.

**(OR)**

- (b) A doubly reinforced beam of width 250 mm and 500 mm effective depth is reinforced with 2 bars of 20 mm diameter as compression reinforcement and 6 bars 20 mm diameter as tension steel at an effective cover of 50 mm on both the sides. Find the ultimate moment of resistance of the section. Use M 20 grade concrete and Fe 415 steel.
12. (a) Design a reinforced concrete slab to carry a live load of 3 kN/m<sup>2</sup> on an effective span of 4 m. Use M 20 grade concrete and Fe 415 steel.

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**(OR)**

(b) Design a two-way slab for a room  $6000 \text{ mm} \times 4000 \text{ mm}$  clear in size, if the superimposed load is  $3 \text{ kN/m}^2$  and floor finish of  $1 \text{ kN/m}^2$ . The edges of the slab are simply supported and corners are not held down. Use M 20 grade concrete and Fe 415 steel.

**13.** (a) Calculate the ultimate moment of resistance of T-beam which has simply supported span of 5 m.

Width of flange : 1500 mm

Thickness of flange : 100 mm

Width of web : 230 mm

Effective depth : 600 mm

The reinforcement consists of 4 bars of 20 mm diameter. Use M 20 grade concrete and Fe 415 steel.

**(OR)**

(b) A Tee-beam of effective flange width of 800 mm, thickness of slab 90 mm, width of the rib 230 mm and effective depth 400 mm is reinforced with 5 numbers of 20 mm diameter bars. Calculate the moment of resistance of the section. Use M 20 concrete and Fe 415.

**14.** (a) Design a short circular column to carry an axial load of 1000 N using lateral ties. Use M 20 grade concrete and Fe 415 steel.

**(OR)**

(b) Design an axially loaded rectangular column to carry a load of 800 kN. Use M 25 grade concrete and Fe 415 steel.

**15.** (a) A reinforced concrete column of size  $400 \text{ mm} \times 400 \text{ mm}$  carries a load of 750 kN. The safe bearing capacity of soil is  $200 \text{ kN/m}^2$ . Design an isolated column footing with uniform thickness. Use M 20 grade concrete and Fe 415 steel.

**(OR)**

(b) Design a square footing of uniform thickness for a reinforced concrete column of  $350 \text{ mm} \times 350 \text{ mm}$  in size carrying an axial load of 1000 kN using M 20 grade concrete and Fe 415 steel. The safe bearing capacity of the soil is  $200 \text{ kN/m}^2$ . Check for bearing pressure and development length are not required.

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## PART—C

10×1=10

- Instructions :** (1) Answer the following question.  
(2) The question carries **ten** marks.  
(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.

**16.** Design a singly reinforced continuous RC rectangular beam for flexure at middle of interior span with the following data.

No of spans = 3

Clear distance between supports = 3600 mm

Width of support = 300 mm

Imposed load (not fixed) = 5 kN/m<sup>2</sup>

Imposed load (fixed) = 7.5 kN/m<sup>2</sup>

Use M 20 grade concrete and Fe 415 steel.

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