

\*

**c20-c-402**

**7425**

**BOARD DIPLOMA EXAMINATION, (C-20)**

**NOVEMBER/DECEMBER—2022**

**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) Answers should be brief and straight to the point and shall not exceed five simple sentences.

1. What is the necessity of providing reinforcement in concrete? Why is steel used as reinforcement?
2. Name the various types of sections in a singly reinforced rectangular beams based on quantity of steel. How do you identify each in working stress method?
3. Define characteristic strength of concrete. Explain what is meant by M20 mix.
4. State the various limit states to be considered in the limit state design.
5. State the equations for minimum and maximum area of tension reinforcement in beams and hence calculate minimum and maximum area of steel for a beam 300 mm × 450 mm effective dimensions, effective cover 40 mm, Fe-415 grade steel is used.
6. What is meant by doubly reinforced beam? Mention two situations where it is used.

**/7425**

**1**

*[ Contd...*

7. State the IS codal provisions for limiting vertical deflection for different types of beam/slab.
8. Find the effective flange width of the following simply supported isolated Tee beam if  $l_o=5$  m. Actual width of the flange = 900 mm, width of web = 230 mm, thickness of flange = 100 mm.
9. Sketch a three span continuous beam and mark the location where the tension reinforcement is provided.
10. What is meant by slenderness ratio of a column? State the conditions to consider a column as long or short column.

**PART—B**

8×5=40

- Instructions :**
- (1) Answer all **five** questions.
  - (2) Each question carries **eight** marks.
  - (3) Answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.

11. (a) A singly reinforced rectangular beam is subjected to a bending moment of 45 kN-m at working loads. Design the beam for flexure. The materials used are M 20 grade concrete and Fe 415 steel. Provide an effective depth 1.5 times the breadth.

**( OR )**

- (b) An RCC beam 230 mm wide and 430 mm deep is reinforced with 4 bars of 16 mm diameter of grade Fe 415 on tension side. If the design shear force is 60 kN, design the shear reinforcement consisting only of vertical stirrups. The grade of concrete used is M20.

12. (b) A simply supported RCC slab has to be provided for the roof of a room of clear dimensions 4m × 9m. Width of supporting wall is 300 mm. The weight of weathering course over the slab is 1 kN/m<sup>2</sup>. Take the live load on the slab as 2 kN/m<sup>2</sup>. Design the slab using M20 grade concrete and Fe 415 bars. Check the design for stiffness.

/7425

2

[ Contd...

\*

( OR )

(b) Design a floor slab for a hall  $4\text{ m} \times 6\text{ m}$  to carry a live load of  $3\text{ kN/m}$  and a floor finish of  $1\text{ kN/m}$ . Walls are  $300\text{ mm}$  wide. Use M20 grade concrete and Fe 415 steel. The corners of the slab are not held down.

13. (a) A Tee beam of effective flange width  $1500\text{ mm}$ , thickness of slab  $100\text{ mm}$ , width of rib  $300\text{ mm}$  and effective depth  $460\text{ mm}$  is reinforced with 4 nos of  $16\text{ mm}$  diameter bars, calculate the factored moment of resistance. The materials are M20 grade concrete and Fe 415 steel.

( OR )

(b) A Tee beam of effective flange width  $800\text{ mm}$ , thickness of slab  $90\text{ mm}$ , width of rib  $230\text{ mm}$ , and effective depth  $400\text{ mm}$  is reinforced with 5 numbers of  $20\text{ mm}$  diameter bars. Calculate the moment of resistance of the section. M20 grade concrete and Fe 415 bars are used.

14. (a) Design the short, axially loaded rectangular column to support a load of  $1250\text{ kN}$ . One side of the column is restricted to  $230\text{ mm}$ . Use M25 concrete and Fe 415.

( OR )

(b) Design a circular column to carry an axial load of  $1300\text{ kN}$  using lateral ties. Use M20 grade concrete and Fe 415 steel.

\*

15. (a) Design an RCC footing of uniform thickness to carry an axial load of  $1400\text{ kN}$  from a square column of size  $400\text{ mm} \times 400\text{ mm}$ . The safe bearing capacity of soil is  $220\text{ kN/m}^2$ . Use M20 grade concrete and Fe 415 steel.

( OR )

(b) Explain the types of footings used for the concrete structures.

/7425

3

[ Contd..

\*

\*

**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 details.

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> (excluding self weight)

Use M20 grade concrete and Fe 415 steel.

★ ★ ★

\*

\*