

7425

BOARD DIPLOMA EXAMINATION, (C-20) OCTOBER/NOVEMBER—2023

DCE - FOURTH SEMESTER EXAMINATION

DESIGN AND DETAILING OF RC STRUCTURES

Time: 3 Hours [Total Marks: 80

PART—A

 $3 \times 10 = 30$

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.
- (4) Assume suitable data, if necessary.
- (5) IS 456: 2000 code and SP-16 are allowed with candidates.
- **1.** Write the equation of tensile strength and modulus of elasticity of concrete as per IS 456-2000.
- **2.** State the methods for design of reinforced concrete structures.
- **3.** Define characteristic strength of materials and characteristic loads.
- **4.** Write any three assumptions made in the limit slate design.
- **5.** Calculate the development length of 16 mm Fe-415 bar in tension and compression with M-30 grade concrete.
- **6.** What is the maximum permitted spacing of shear reinforcement as per IS 456-2000?
- **7.** Classify the slabs based on spanning direction and support conditions.
- **8.** Write the formulae for calculating the effective flange width of the T-beam and isolated T-beam.

Calculate the maximum factored moment at the middle of interior span of 3-span continuous floor slab with the following data:

Factored dead load = 8.4 kN/m

Factored live load = 3.75 kN/m

Effective span = 3.39 m

List any three IS code provisions for longitudinal reinforcement in design of columns.

PART—B

 $8 \times 5 = 40$

- **Instructions:** (1) Answer **all** questions.
 - (2) Each question carries **eight** marks.
 - (3) Answers should be comprehensive and criterion for valuation is the content but not the length of the answer.
 - (4) Assume missing data. If any suitably IS 456: 2000 code and SP-16 are allowed with candidates.
- (a) A singly reinforced concrete beam section 250 mm × 550 mm 11. overall is reinforced with 3 bars of 20 mm diameter with an effective cover of 50 mm. The beam is cantilever of span 3 meters. Find the uniformly distributed load the beam can carry, when M-20 grade concrete and Fe-415 steel are used.

(OR)

- An R.C.C beam 230 mm wide and 450 mm effective depth is reinforced with 6 bars of 16 mm dia on tension side. If the design shear force is 120 kN, design the shear reinforcement consisting only of vertical stirrups. Use M-20 grade concrete and Fe-415 steel.
- Design the simply supported slab for a room of size 3 m × 8 m to **12**. carry a live load of 3 kN/m² and floor finish of 0.8 kN/m². Walls are 230 mm wide. Use M-20 concrete and Fe-415 steel. Check the design for stiffness.

(OR)

Design a two-way slab for a room 4200 mm × 3500 mm clear in size, if the superimposed load is 3.5 kN/m² and floor finish of 1 kN/m². The edges of the slab are simply supported and corners are not held down. Use M-20 grade concrete and Fe-415 steel.

/7425 [Contd... **13**. (a) A Tee-beam of effective flange width of 1200 mm, thickness of slab 110 mm, width of the rib 300 mm and effective depth 470 mm is reinforced with 4 numbers of 16 mm diameter bars. Calculate the moment of resistance of the section. Use M-20 concrete and Fe-415.

(OR)

- A RCC singly reinforced simply supported Tee-beam has a flange of 750 mm width and 120 mm thickness is having area of steel 3500 mm² provided at an effective depth of 450 mm and width of web is 250 mm. Calculate the moment resistance of the section using M-20 concrete and Fe-415 steel.
- 14. Design a short column square in section to carry an axial load of (a) 1600 kN using M-20 grade concrete and Fe-415 steel.

(OR)

- Design a short circular column with helical reinforcement to carry an axial load of 1000 kN using M-20 and Fe-215 grade materials.
- 15. Design an RCC footing of uniform thickness for RCC column of 450 mm × 450 mm size carrying an axial load of 1400 kN using M-20 concrete and Fe-415 steel. Take safe bearing capacity of soil as 220 kN/m^2 .

(OR)

A reinforced concrete column of size 300 mm × 300 mm carries a load of 750 kN. The safe bearing capacity of soil is 200 kN/m². Design an isolated column footing with uniform thickness. Use M-20 grade concrete and Fe-415 steel.

PART—C

 $10 \times 1 = 10$

- **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 lintel over a door 2.4 m wide. The height of brick work above the opening is 3 m. Masonry weighs 19 kN/m³. The brick walls are 230 mm thick. Use M-20 grade concrete and Fe-415 steel.
