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C20-C–402

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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 3×10=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.

9. 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

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

PART—B

8×5=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.

11. *(a)* A singly reinforced concrete beam section 250 mm × 550 mm 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)

(b) 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.

12. *(a)* Design the simply supported slab for a room of size 3 m × 8 m to carry a live load of 3 kN/m^2 and floor finish of 0.8 kN/m^2. Walls are 230 mm wide. Use M-20 concrete and Fe-415 steel. Check the design for stiffness.

(OR)

(b) Design a two-way slab for a room 4200 mm × 3500 mm clear in size, if the superimposed load is 3.5 kN/m^2 and floor finish of 1 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)* 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)

(b) 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 mm^2 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. *(a)* Design a short column square in section to carry an axial load of 1600 kN using M-20 grade concrete and Fe-415 steel.

(OR)

(b) 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. *(a)* 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)

(b) 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/m^2. Design an isolated column footing with uniform thickness. Use M-20 grade concrete and Fe-415 steel.

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

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