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BOARD DIPLOMA EXAMINATION, (C-16)

MARCH / APRIL — 2021

DCE — FOURTH SEMESTER EXAMINATION

REINFORCED CONCRETE STRUCTURES

Time : Three Hours]   [*Maximum Marks* : 80

PART-A   3×10=30

Instructions : (*i*) Answer **all** questions.

(*ii*) Each question carries **three** marks.

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

1. State any three advantages of RCC when compared to other building materials.

2. State any three differences between working stress and limit state methods of design.

3. Define the following :

(*a*) Balanced Section in Limit state design

(*b*) Limiting percentage of steel

(*c*) Bond stress

4. Find the spacing of 8 mm 2 legged vertical stirrups for RCC beam of 230 mm × 450 mm effective depth to resist a factored shear force of 80 kN. Use M20 concrete and Fe415 steel.

5. What is restrained slab ? State the equations given in IS 456 - 2000 to find the design bending moments in restrained slabs.

6. How do you find the effective span of a staircase spanning longitudinally as per IS 456 - 2000?

7. Find the effective flange width of the following simply supported T-beam.

      Effective span = 5.3 m

      c/c distance of adjacent panels = 3.1 m

      Breadth of the web = 230 mm

      Thickness of slab = 110 mm

8. Explain the advantages of continuous beam with respect to stiffness as compared to single-span beam.

9. Calculate shear force at outer side of support next to end support for a continuous beam as per IS 456 - 2000. Size of beam is 300 mm × 460 mm overall. Effective span = 3.5 m. Imposed load (not fixed) is 10 kN/m, imposed load (fixed) is 10 kN/m excluding self weight.

10. State the types of columns based on :

(*a*) types of loading

(*b*) slenderness ratio

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PART-B
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10×5=50
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Instructions :   (*i*) Answer any **five** questions.

               (*ii*) Each question carries **ten** marks.

              (*iii*) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.

11. A reinforced concrete beam 300 mm × 610 mm overall depth is reinforced with 4 bars of 20 mm diameter with an effective cover of 55 mm. Determine the uniformly distributed load the beam can carry excluding of self weight (live load). The beam is simply supported over a span of 5 m. Use M20 grade concrete and Fe415 steel. Use working stress method.

12. Design a rectangular RCC beam simply supported over a clear span of 4 m. The superimposed load is 22kN/m and support width is 230 mm each. Use M_{20} concrete and Fe415 steel. Check the design for deflection. Shear reinforcement need not be designed.

13. Determine the tension and compression steels required for a double reinforced rectangular beam with the following data. Overall size of beam = 250 mm × 550 mm, Factored moment = 260 kNm, Effective cover = 50 mm. Use M20 concrete and Fe415 steel.

14. Design the floor slab for a room of size 4 m × 5 m to carry a live load of 3 kN/m^2 and floor finish of 0.8 kN/m^2. The slab is continuous over two adjacent walls of the room. Walls are 230 mm wide. Use M20 concrete and Fe415 steel.

15. A Tee-beam floor consists of 150mm thick RCC slab monolithic with 300 mm wide beams. The beams are spaced at 3.3m centre to centre and their effective span is 6 m. If the super imposed load on the slab is 5 kN/m^2, design an intermediate Tee-beam. Use M20 concrete and Fe415 steel.

16. A continuous RCC rectangular beam of size 300 mm $\times$ 500 mm effective is supported on 300 mm $\times$ 300 mm RCC columns at 3 m intervals. The beam carries an imposed load (fixed) of 12 kN/m including its self-weight and imposed load (not fixed) of 10 kN/m. Design the beam reinforcement for the beam at the support next to end support. Use M20 concrete and Fe415 steel.

17. Design a short column square in section to carry an axial load of 1800 kN using M25 concrete and Fe415 steel.

18. A reinforced concrete column of size 230 mm $\times$ 230 mm carries a load of 600 kN. The safe bearing capacity of soil is 200 kN/m^2. Design an isolated column footing with uniform thickness. Check for two way shear only. Use M20 concrete and Fe415 steel.

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