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BOARD DIPLOMA EXAMINATION, (C-16)

AUGUST/SEPTEMBER—2021

DCE - FOURTH SEMESTER EXAMINATION

REINFORCED CONCRETE 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. Define characteristic strength and characteristic load.

2. State any three advantages of limit state method over working stress method.

3. Calculate the development length in tension for Fe-250 bar of 25 mm diameter and M-20 concrete.

4. Find the depth of neutral axis of singly reinforced rectangular beam 230 mm × 400 mm effective depth, reinforced with 4 bars of 12 mm diameter. Grade of concrete is M-20 and grade of steel is Fe-415. Use limit state method.

5. State the IS code provisions for design of torsion reinforcement in two-way corners held down slab.

6. Differentiate between one-way and two-way slabs.

7. Find the effective flange width of a T-beam with the following details :

Effective span = 5·5 m

Centre-to-centre distance of adjacent panels = 4 m

Breadth of web = 300 mm

Thickness of slab = 120 mm

8. Write the bending moment coefficients for a three-span continuous beam at salient points.

9. What are the conditions to be satisfied to adopt the moment and shear coefficients given in IS 456-2000 for continuous beams/slabs?

10. Calculate the load carrying capacity of a short axially loaded column of size 230 mm × 350 mm, reinforced with 6 bars of 16 mm diameter, Fe-415 grade steel. Concrete is M-25 grade.

PART—B

10×5=50

Instructions : (1) Answer *any* **five** questions.

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

(3) Answers should be comprehensive and criterion for valuation is the content but not the length of the answer.

11. A singly reinforced rectangular concrete beam of 300 mm wide and 550 mm effective depth is reinforced with 5 bars of 20 mm diameter. Using M-20 grade concrete and Fe-415 grade steel, calculate the moment of resistance of the beam in working stress method.

12. An RC beam of rectangular section has to carry a factored shear force of 150 kN. If the beam is of 230 mm wide and 350 mm effective depth, determine the spacing of 8 mm two-legged vertical stirrups required to resist the given shear force. Use M-20 grade concrete and Fe-415 grade steel.

13. 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.

14. The floor slab of a classroom of 3 m × 5 m is discontinuous on all its four sides. The corners of the slab are prevented from lifting. 50 mm thick floor finish of unit weight 20 kN/m^3 is to be provided over the slab. Live load on the slab is 3 kN/m^2. Width of the support is 230 mm. Design the slab using M-20 grade concrete and Fe-415 steel. Design the torsion reinforcement also.

15. A T-beam of effective flange width 800 mm, thickness of slab 90 mm, width of 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. M-20 grade concrete and Fe-415 bars are used.

16. A continuous RCC rectangular beam of size 250 mm × 500 mm overall depth is supported by 300 mm × 300 mm size masonry pillars at clear intervals of 4 m. The beam carries a dead load of 20 kN/m including its self-weight and an imposed load for 10 kN/m. Design the reinforcement at *(a)* middle of the end span and *(b)* middle of interior span. Use M-20 concrete and Fe-415 steel.

17. Design a circular column to an axial load of 1100 kN using lateral ties. Use M-20 concrete and Fe-415 steel.

18. Design a square reinforced concrete footing of uniform thickness for an RC column of 400 mm × 400 mm carrying an axial load of 1200 kN using M-20 grade concrete and Fe-415 steel. The safe bearing capacity of soil is 220 kN/m^2. Check for development length and check for bearing pressure are not required.

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