C20-C–402

7425

BOARD DIPLOMA EXAMINATION, (C-20)

JUNE/JULY—2022

DCE – FOURTH SEMESTER EXAMINATION

DESIGN AND DETAILING OF R. C. STRUCTURES

Time : 3 hours] [*Total Marks* : 80

PART—A

3×10=30

Instructions : (1) Answer **all** questions.

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

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

1. List out the advantages of concrete when compared with other building materials.

2. State the types of steel used in RC members. Why is steel used as reinforcement?

3. State various limit states to be considered in limit state design.

4. Explain the role of partial safety factors in limit state design.

5. State any four situations in which the doubly reinforced beams are used.

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

7. Distinguish between one-way slab and two-way slab.

8. Find the effective flange width of the following simply supported Tee-beam.

Effective span = 5·0 m

C/C distance of adjacent panels = 4·0 m

Breadth of the web = 300 mm

Thickness of slab = 110 mm

9. Write any three advantages of continuous beams.

10. What are the specifications for lateral ties in a colum?

PART—B

8×5=40

Instructions : (1) Answer either *(a)* **or** *(b)* from *each* questions from part-B.

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

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

11. *(a)* Design a rectangular simply supported reinforced concrete beam over a clear span of 4000 mm. The superimposed load is 20 kN/m and support width is 300 mm each. Use M 20 grade concrete and Fe 415 grade steel. Check the design for deflection.

(OR)

(b) Calculate moment of resistance of an RC beam of rectangular section 300 mm x 400 mm deep. Area of steel consists of 6 nos. 18ϕ in tension side and 3 nos. 18ϕ in compression side. Assume effective cover of 35 mm on both sides. Concrete is of M 20 grade and steel Fe 415.

12. *(a)* Design a one-way slab to carry a live load of 3kN/m^2 over an effective span of 3·5 m. Use M 20 grade concrete and Fe415 grade steel. Sketch the reinforcement details.

(OR)

(b) Design a simply supported RCC slab over the roof of a room of clear dimensions 4·5 m × 5·5 m. The width of supporting wall is 230 mm. The slab carries a superimposed load of 2 kN/m^2 and floor finish of 1 kN/m^2. Use M-20 grade concrete and Fe-415 steel.

13. *(a)* Find the moment carrying capacity of a T-beam of effective flange width 1200 mm, thickness of slab 100 mm, rib width 300 mm and effective depth 460 mm, reinforced with 4-number of Fe-415 grade steel bars of 12 mm diameter. The concrete used is of grade M-20.

(OR)

(b) A T-beam of effective flange width-750 mm, Thickness of slab-110 mm, width of rib-250 mm, effective depth-600 mm, Reinforcement-2400 mm^2 bars. Calculate ultimate moment of resistance. Use M-20 grade concrete and Fe-415 steel.

14. *(a)* Design the reinforcement for an axially loaded short square column to carry an axial load of 800 kN using M-20 grade concrete and Fe-415 steel.

(OR)

(b) Design a square column 400 mm × 400 mm, 3·3 m long subjected to a working load of 1000 kN. Use M-20 grade concrete and Fe-415 grade steel. The column is effectively held in position and direction at both the ends.

15. *(a)* 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. Check for development length and check for bearing pressure is not required.

(OR)

(b) Explain the design procedure is isolated square footing of uniform depth under a square column.

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 for the following conditions. Use M-20 grade concrete and Fe-415 steel.

No. of spans = 3
Clear distance between supports = 3600 mm
Width of support = 300 mm.
Imposed load (not fixed) = 5kN/m^2
Imposed load (fixed) = 7·5 kN/m^2 (excluding self weight)
Partial fixity may be expected at the discontinuous edge.

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