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C20-C–501

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BOARD DIPLOMA EXAMINATION, (C-20)

OCTOBER/NOVEMBER—2023

DCE – FIFTH SEMESTER EXAMINATION

STEEL 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) Use of IS : 800-2007, IS : 875-1987 and steel tables are permitted.

1. What are the physical properties of structural steel?

2. Sketch the cross-section of a fillet weld and name the component parts.

3. Calculate the safe load transmitted by a site welded joint, if the size of the weld is 6 mm and its length is 250 mm. Take F_u = 410 MPa.

4. Write the different types of failures of a tension member.

5. Draw any six shapes of members used as compression members.

6. Write the codal provisions for double angle discontinuous struts.

7. What are the different types of column bases?

8. State the classification of cross-sections.

9. Name any three types of web stiffeners in plate girders.

10. Determine the live load per sq.m. of plan area of the pitched roof of 25°.

PART—B

8×5=40

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

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

11. *(a)* An angle ISA 90 × 90 × 8 mm is carrying an axial design tension of 300 kN is connected to a gusset plate 12 mm thick by a lap joint using side welds only at work-site. Design the joint taking the ultimate shear stress in the weld as 410 N/mm^2.

(OR)

(b) A double-angle tension member consists of two ISA 110 × 110 × 12 mm carrying an axial tension of 500 kN is to be connected to a gusset plate by fillet welds along the ends and sides of the leg. Design the welded joint. The ultimate shear stress in the weld is 300 MPa. Assume connections are made in the workshop.

12. *(a)* Determine the design strength of tension member of size 100 mm × 75 mm × 8 mm, when its longer leg is connected to a 12 mm thick gusset plate by 6 mm size fillet welds. The effective length of weld is 120 mm; f_y = 250 MPa and f_u = 410 MPa.

(OR)

(b) Design a single-angle tension member of a roof truss to carry a factored tensile force of 250 kN. The angle is to be connected to a gusset plate through its longer leg by fillet welds. The length of weld is 120 mm. Take f_y = 250 MPa and f_u = 410 MPa.

13. *(a)* Determine the design axial load on a column section ISMB-400 @ 615 N/m, given that the height of column is 5 m and both ends of column is fixed; f_y = 250 N/mm^2, f_u = 410 N/mm^2 and E = 2 × 105 N/mm^2.

(OR)

(b) State any four design specifications for lacing as per IS 800-2007.

14. *(a)* Design a slab base for a column ISHB 300 @ 577 N/m carrying an axial load of 750 kN. M20 grade concrete is used for foundation. Design the concrete pedestal also. SBC = 180 kN/m^2 and f_y = 250 N/mm^2.

(OR)

(b) Design a single-angle strut for a roof truss to carry a factored compressive load 200 kN. The length of the angle between centre to centre of intersection is 2·8 m. Assume the end condition is fixed; f_y = 250 N/mm^2 and $E = 2 \times 10^5$ N/mm^2.

15. *(a)* Determine the design bending strength of a laterally restrained beam ISMB 300 @ 442 N/m. The yield stress of steel is 250 MPa.

(OR)

(b) Design a rolled steel beam using I-section of effective span 6 m, if the beam carries a udl of 40 kN/m excluding self weight of beam. Self weight of beam is 0·5k N/m. The beam is adequately supported laterally. Check the beam for shear and deflection. If E = 2×10^5 N/mm^2 and f_y = 250 N/mm^2.

PART—C

10×1=10

Instructions : (1) This question is compulsory.

(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. Determine the shape factor of a symmetrical I-section with flange dimensions 250 mm × 15 mm and web 12 mm × 275 mm.

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