C20-C-501

7618

BOARD DIPLOMA EXAMINATION, (C-20)

DECEMBER—2022

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) Use of IS : 800-2007 and steel tables are permitted.

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

1. What are the merits of steel structures?

2. Sketch the cross-section of fillet weld and butt weld.

3. Define the terms *(a)* effective length of weld and *(b)* effective throat thickness.

4. Calculate the gross cross-sectional area of tie member ISA 90 × 60 × 8 mm if the longer leg is connected to gusset plate.

5. What are different types of cross-sections used as columns?

6. What are the factors affecting stress reduction?

7. Write any three codal specifications of lacing as per IS : 800-2007.

8. Write down the component parts of a plate girder and mention their functions.

9. Define the terms *(a)* elastic moment and *(b)* plastic moment.

10. List the component parts of roof truss.

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.

11. *(a)* An ISA 150 × 115 × 10 mm carries an axial tension of 500 kN and is connected to gusset plate along the ends and sides of the longer leg. Design the welded connection with side and end weld if the ultimate shear stress in the weld is 410 MPa. Assume connections are made at site.

(OR)

(b) A tie member in a roof truss consists of 2 ISA 100 × 75 × 8 mm. The angles are connected to either side of a 10 mm gusset plate and the member is subjected to a working pull of 300 kN. Design the welded connection. Assume connections are made in the workshop. Take f_u = 410 N/mm^2.

12. *(a)* Determine the tensile strength of a single angle tension member ISA 100 × 65 × 10 mm when its longer leg is connected to 10 mm thick gusset plate by 6 mm size fillet welds. The length of weld is 150 mm. Take f_y = 250 N/mm^2 and f_u = 410 N/mm^2.

(OR)

(b) Design a single angle tension member of a roof truss to carry a factored tensile force of 225 kN. The angle is to be connected to a gusset plate through its longer leg by fillet welds. Take f_y = 250 N/mm^2, f_u = 410 N/mm^2. The length of the member is 3·0 mts.

13. *(a)* Determine the design axially loaded capacity of the column ISHB 300 at 577 N/m if the length of the column is 3 m and its both ends, pinned (hinged). Take f_y = 250 N/mm^2, f_u = 410 N/mm^2, E = 2 × 10^5 N/mm^2.

(OR)

(b) Design a single angle strut for a roof truss to carry a compressive load of 110 kN. The length of the angle between center to center of intersections is 2·2 m. Assume that end connections is done by fillet welds. Take f_y = 250 MPa.

14. *(a)* Design a slab base with rectangular base plate having equal projections for a column ISHB 300@577 N/m to carry factored of 1500 kN. Assume M20 grade of concrete and yield stress of steel is 250 MPa. Also design concrete pedestal, if the SBC of the soil is 200 kN/m^2.

(OR)

(b) What is lacing? Write any six codal provisions to be followed in the design of lacing system as per IS : 800-2007.

15. *(a)* An ISMB 250@365 N/m is used as a simply supported beam with an effective span of 5 m. Calculate design shear strength and design bending strength of the beam. Assume the beam as laterally supported. Take f_y = 300 N/mm^2.

(OR)

(b) A rolled steel beam has an effective span of 5m and carries total UDL of 120 kN including self-weight. If compressive flange is laterally restrained, design an I-section beam. Take f_y = 250 N/mm^2, E = 2 × 10^5 N/mm^2. Check the adequacy of section in shear and deflection.

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. A roof of a hall measuring 8 m × 12 m consists of 100 mm thick RCC slab supported on steel I-beam spaced at 3 m c/c. The finishing load is taken as 0·9 kN/m^2 and live load as 1·5 kN/m^2. Design the steel beam. Take thickness of wall as 300 mm and f_y = 250 N/mm^2.

★★★