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C16-C–501

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BOARD DIPLOMA EXAMINATION, (C-16)

AUGUST/SEPTEMBER—2021

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.

(5) Assume any suitable data, if necessary.

1. Define limit state. State different types of limit states to be considered in the limit state design.

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2. List out different types of welded joints.

3. Write the formula for designing shear strength of a fillet welded joint.

4. Name and sketch any three types of sections used for the tension members.

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5. Briefly explain the following terms :

(a) Imperfection factor

(b) Stress reduction factor

6. What are the different types of column bases?

7. Distinguish between laterally restrained beam and unrestrained beam.

8. State the situations where the plate girders are necessary.

9. Draw the neat sketch of a roof truss and name the component parts.

10. How much live load do you consider in the design of a steel truss having an angle of slope of truss 30°?

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. The longer leg of an unequal angle ISA 125 mm × 75 mm × 8 mm is connected to gusset plate of thickness 12 mm by lap joint welding. It carries a factored tensile load of 300 kN. Design the welded joint assuming size of weld as 6 mm and the fabrication is to be done in the field. The welds are to be provided only at sides. [Given, f_u = 410 N/mm^2]

12. Design a single angle tension member to carry a tensile force of 250 kN. The angle is to be connected to a gusset plate with longer leg by fillet welds. Take f_y = 250 N/mm^2, f_u = 410 N/mm^2. Assume length of the connection as 150 mm.

13. Determine the design compressive strength of single ISHB 400@806 N/m when it is used as a column of 5 m height with both of its ends restrained against translation and rotation. The yield stress of steel used is 300 MPa. Take $E = 2 \times 10^5$ N/mm^2.

14. *(a)* What is lacing? Write down the objectives of lacing. 4

(b) Write down any six codal provisions as per IS 800-2007, for the design of battening system. 6

15. Design a slab base with rectangular base plate having equal projections for a column section consisting of ISHB 250@536 N/m carrying an axial load of 900 kN including self-weight. Use M-20 grade concrete and Fe-250 grade steel. Also design the concrete pedestal if safe bearing capacity of soil is 180 kN/m^2.

16. A simply supported beam ISMB 350@514 N/m has an effective span of 4 m.

Find

(a) the design bending strength of beam;

(b) the design shear strength of beam;

(c) the intensity of UDL that the beam can carry under service conditions;

(d) the maximum deflection.

Assume that the beam is laterally supported and the grade of steel is E 250.

17. Design a rolled steel I-section to act as a simply supported beam with span 4 m carrying a UDL of 42 kN/m including the self-weight. Check the beam for shear and deflection if the beam is laterally restrained. [Use Fe-410 grade steel]

18. A roof truss of span 16 m and pitch 25° is used for A.C. sheet roofing. The trusses are 4 m apart and the wind pressure may be assumed as 1400 N/m^2. Determine the following :

(a) Dead load

(b) Wind load

(c) Live load at

(i) internal panel points and

(ii) end panel points of truss

Assuming the following data :

Unit weight of A.C. sheet roofing : 200 N/m^2 of plan area

Unit weight of purlin : 110 N/m^2 of plan area

Unit weight of bracing : 25 N/m^2 of plan area

Permeability : Medium

Height at eaves level : 8 m

Number of top panels : 6

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