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C16-C–501

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BOARD DIPLOMA EXAMINATION, (C-16)

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 and each question carries **three** marks.

(2) Answer should be brief and straight to the point.

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

1. List the physical properties of steel structures.

2. Define *(a)* effective length and *(b)* end return of fillet weld.

3. Sketch a fillet weld and name the components.

4. Determine the net area of a Tension member ISA 90 mm × 60 mm × 8 mm, when its longer leg is connected to a gusset plate.

5. State any six forms of compression members in steel structures.

6. Write any three codal provisions to be followed in the design of lacing system as per IS : 800-2007.

7. Determine the shape factor for rectangular beam.

8. State the different types of stiffeners used in plate girder.

9. Determine the live load per square meter on a sloping roof with slope 24°.

10. Write the relation between design wind speed and design wind pressure.

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. An angle ISA 100 mm × 100 mm × 12 mm is carrying an axial design tensile force of 220 kN acting through the CG of the angle is to be connected to a gusset plate 12 mm thick by a lap joint using side welds and end welds, at site. Design the joint taking the ultimate design stress in the filet weld as 410 N/mm^2.

12. Determine the design strength of tension member of size 90 mm × 60 mm × 8 mm when its longer leg is connected to a 10 mm thick gusset plate by 6 mm size fillet welds. The effective length of weld is 180 mm. f_y = 250 MPa and f_u = 410 MPa.

13. Design a steel column using a single rolled I-section to carry an axial load of 750 kN. One end of the column is restrained against translation and rotation and the other end is restrained against translation and free against rotation. The actual length of the column between intersections is 5 m and the yield stress of steel is 250 MPa.

14. Design a single-angle strut for a roof truss to carry a factored compressive load 180 kN. The length of the angle between centre to centre of intersection is 3 m. Assume the end condition to be fixed an f_y = 250 N/mm^2.

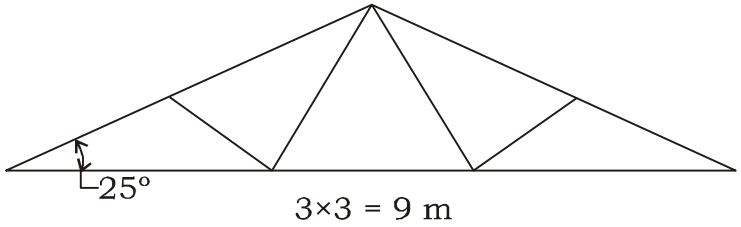
15. Design a slab base for a column ISHB 300 @ 577 N/m carrying an axial load of 1200 kN. M_{20} grade concrete is used for foundation. Provide welded connection between column and base plate. Design concrete pedestal also. SBC = 200 kN/m^2 and f_y = 250 MPa.

16. *(a)* Write a note on the effect of holes in the tension zone of a laterally supported beam.

(b) Write a short note on shear lag effect in beams.

17. A simply supported beam ISMB 400 @ 616 N/m is subjected to a BM of 100 kN/m and SF of 80 kN. Check the safety of the beam in bending and in shear, if the beam is laterally restrained. Take f_y = 250 N/mm^2.

18. The line sketch of truss of 9 m span is shown in the figure :



The trusses are placed at 3 m apart and carry a corrugated AC sheets roofing on angle purlins. The slope of the roof is 25°. The basic wind pressure for the place is 1500 N/m^2. If the building is of normal permeability, determine *(a)* dead load, *(b)* wind load and *(c)* live load at various panel points of the truss. Consider the following :

(i) Weight of AC sheet as 150 N/m^2

(ii) Weight of purlins as 90 N/m^2

(iii) Height of eves as 7 m

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