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C14–C–601

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BOARD DIPLOMA EXAMINATION, (C–14)

MARCH/APRIL—2018

DCE—SIXTH SEMESTER EXAMINATION

DESIGN OF 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. List different types of loads on steel structures.

2. Sketch the cross-section of fillet weld and show its component parts.

3. List the types of failures of a tension member.

4. Calculate the design tensile strength due to rupture for a plate of size 300 mm × 10 mm, if it is connected to a gusset plate by welding.

5. Define *(a)* actual length, *(b)* effective length and *(c)* slenderness ratio of a column.

6. Draw different shapes of members used as compression members.

7. Define shape factor and write the value of shape factor of a rectangular section of breadth b and depth d.

8. State the situations where plate girders are necessary.

9. Define *(a)* principal rafter and *(b)* ridge line.

10. Determine the live load on a truss if the angle of slope of roof is 25°.

PART—B 10×5=50

Instructions : (1) Answer *any* **five** questions.

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

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

11. The longer leg of an unequal angle 100 mm × 65 mm × 8 mm is to be connected to a gusset plate by a lap joint using side welds only. The member carries a design tensile force of 250 kN acting through the CG of the angle. Design the welded joint taking the ultimate shear stress in the fillet weld as 410 N/mm^2. Assume connections are made in the workshop.

12. Design a single-angle tension member to carry a tensile force of 225 kN. The longer leg of the angle is connected to a gusset plate by fillet welding. Take, f_y 250 N/mm^2, f_u 410 N/mm^2. Assume length of connection as 180 mm.

13. *(a)* State the different methods of connecting components of built-up column and sketch them. 4

(b) Explain the various codal provisions to be followed in the design of lacing system as per IS : 800–2007. 6

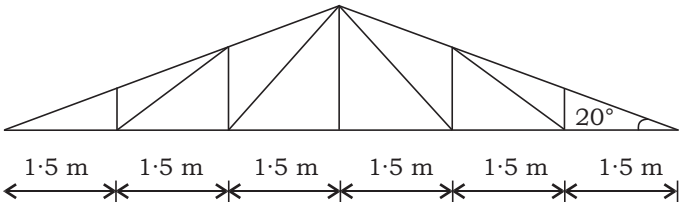
14. Design a steel column using single-rolled I-section to carry an axial load of 1500 kN. Both ends of the column are restrained against translation and rotation. The actual length of the column between intersections is 5 m. The yield stress of the steel is 300 MPa.

15. Design a slab base for a column ISHB 350 @ 724 N/m carrying an axial load of 750 kN. M-20 grade concrete is used for foundation. Calculate the size of concrete pedastral if SBC of soil is 190 kN/m^2. Take f_y 250 N/mm^2.

16. Rolled steel I sections are to be provided at 3 m intervals to support an RC slab of 150 mm thick. The live load on the slab is 3 kN/m^2 and floor finishes is 0 75 kN/m^2. The effective span of the beam is 7·5 m. Design a suitable section for the beam assuming f_y 250 MPa.

17. An ISLB 350 @ 495 N/m is used as a simply supported beam of span 6 m and carries a udl of 25 kN/m including self-weight. The compression flange of the beam is adequately restrained. Check for the shear and maximum deflection if f_y 250 N/mm^2 and E 210 N/mm^2.

18. The line diagram of a steel truss of 9 m span, angle of slope 20° is shown in figure. The roof sheeting is of corrugated GI sheets of unit weight 150 N/sq. m of plan area. The truss supports purlins of unit weight 75 N/sq. m of plan area. The weight of bracing used may be taken as 20 N/sq. m of plan area. The spacing of trusses is 4 m and height of eaves 4·5 m. If the building is of medium permeability, determine *(a)* dead load, *(b)* wind load and *(c)* live load at various panel points of the truss. Assume design wind pressure as 1500 N/mm^2 :



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