Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 70299

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2021.

Sixth Semester

Civil Engineering

CE 6603 – DESIGN OF STEEL STRUCTURES

(Regulations 2013)

Time : Three hours Maximum : 100 marks

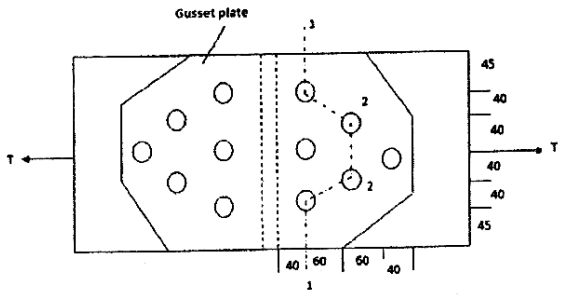
Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. What are the limitations of working stress method?

2. What is meant by strength of fillet weld?

3. Calculate the net effective area for the bolted connection shown in fig. 1 for section 1-2-2-1. Use 4.6 grade bolt of diameter 24 mm.



All dimensions are in mm

Fig. 1

4. What is net sectional area?

5. How is the tendency of a member to buckle measured?

6. With reasons state whether a rolled steel I-section will fail by flexural-torsional buckling.

7. What is meant by slender section?

8. What are the classifications in stiffeners?

9. What is meant by first yield moment?

10. Define Shear Lag.

PART B — (5 × 13 = 65 marks)

11. (a) Find the efficiency of the lap joint shown in Figure Q. 11 (a). The bolts are 20 mm dia. of grade 4.6. The main plates are 10 mm thick. Take pitch as 50 mm and end distance as 40 mm.

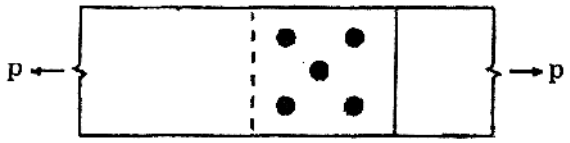


Figure Q. 11 (a)

Or

(b) Considering a weld size of :

(i) 4mm

(ii) 6 mm

Find the service load that can be applied to the fillet weld for the connection shown in Figure Q. 11 (b). Assume shop welding.

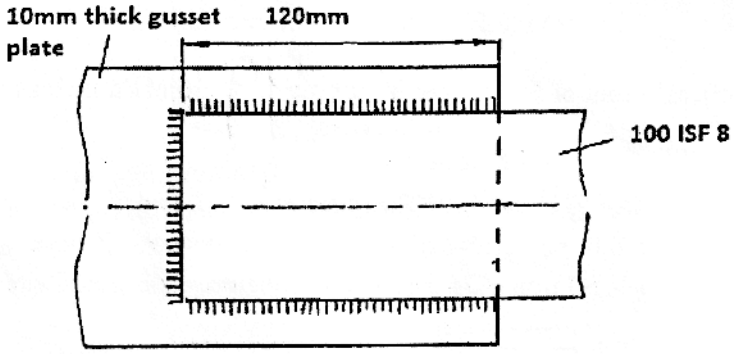


Figure Q. 11 (b)

12. (a) A diagonal member of a roof truss carries an axial tension of 300 kN. Design the section and its connection with a gusset plate and lug angle. Use f_y = 250 MPa and f_u = 410 MPa.

Or

(b) A tension member of a truss consists of two angles 75 × 50 × 6 mm which are provided on either sides of a 10 mm thick gusset plate. 20 mm diameter bolts are used in one row for connecting the member to the gusset plate. Determine the design tensile strength of the member and also number of bolts to develop the design tensile strength.

13. (a) Design the principal rafter of Pratt type roof truss for the following data. Design also its connection using 20 mm diameter bolts.

Design compressive load = 170 kN (due to D.L and L.L)

Design tensile load = 60 kN (due to D.L and LI)

Length of rafter panel = 2.5 m

Grade of steel Fe 410

Grade bolts 4.6. (13)

Or

(b) Design a single angle strut connected to the gusset plate to carry 180 kN factored load. The length of the strut between centre to centre intersections is 3 m. (13)

14. (a) Design a laterally restrained simply supported beam to carry a uniformly distributed load of 44 kN/m. The effective span of the beam is 8 m. A bearing length of 75 mm is provided at the supports.

Or

(b) Design a rolled steel I section for a simply supported beam with a clear span of 6 m. It carries a U.D.L. of 50 kN/m exclusive of self weight of the girder. The beam is laterally unsupported.

15. (a) Design a channel section [shape purlin placed on a sloping roof truss with dead load of 0.15 kN/m^2 (cladding and insulation), a live load of 2 kN/m^2 and wind load of 0.5 kN/m^2 (suction). The purlins are spaced 2 m c/c and of span 4 m, simply supported on a rafter at a slope of 20^o.

Or

(b) Explain step by step procedure in the design of gantry girders. Also explain the loads that would be considered in the design.

PART C — ($1 \times 15 = 15$ marks)

16. (a) Design a bridge compression member of two channels connected toe to toe. The length of the member is 8 m. It carries a load of 1250 kN. The width over the backs of channel is 40 cm. If the channels are connected by battens. Design a suitable section.

Or

(b) A principal rafter in a roof truss has an effective span of 2 m. It has to support a compressive force of 60 kN due to dead load, a compressive force of 70 kN due to live load and a tensile force of 120 kN due to wind load. Design the rafter.

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