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B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

Sixth Semester

Civil Engineering

CE 6603 — DESIGN OF STEEL STRUCTURES

(Regulations 2013)

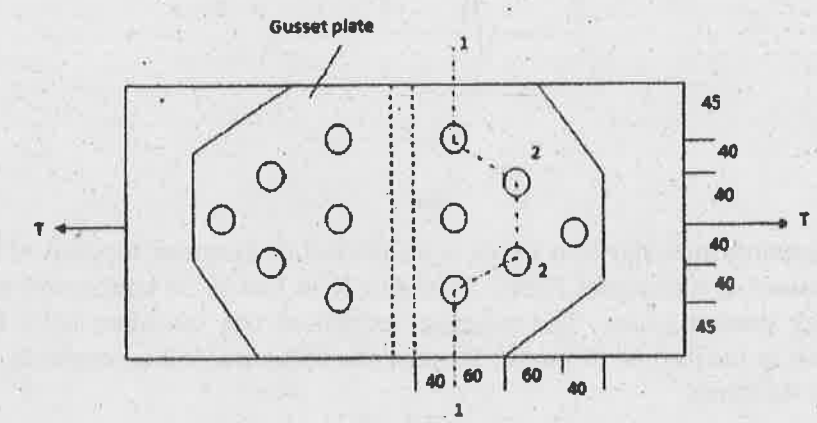
Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Draw the stress-strain curve for mild steel bar showing the salient points.
2. List out the failure of bolted joint.
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 meant by shear lag?
5. Define slenderness ratio.

6. What are the different ways by which a compression member buckles?
7. What are the different types of stiffeners provided in a plate girder?
8. Why do compression flanges require lateral support?
9. Write the equation to calculate the design wind pressure.
10. What is a purlin?

PART B — (5 × 16 = 80 marks)

11. (a) A bracket connection is shown in Fig 2 with 24 mm diameter bolts of grade 4.6 and plate of grade Fe 410 steel, determine the safe load (P) that could be transferred through the connection.

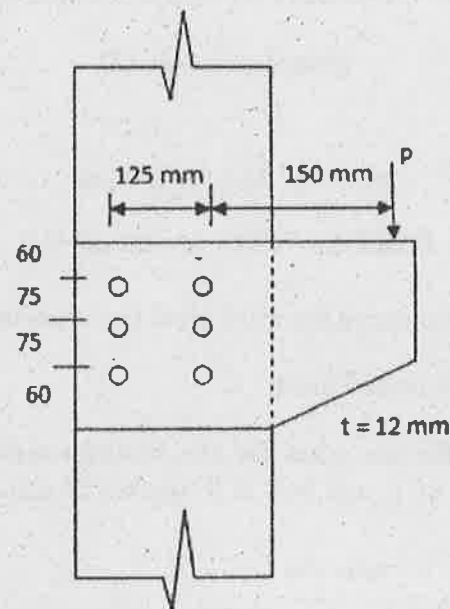


Fig.2

Or

- (b) A tension member of a truss is subjected to factored tension of 850 kN. It consists of a channel ISMC 350@413 N/m has to be connected to a 10 mm thick gusset plate. The overlap length of the member with the gusset plate is limited to 300 mm. Design the fillet welded connection, assuming site welding.
12. (a) Design an angle section to carry a factored tensile force of 200 kN. Bolts of 20 mm diameter of grade 4.6 are to be provided for the connection of the members to the gusset plate. Use $f_y = 250$ MPa and $f_u = 410$ MPa.

Or

- (b) A tension member consists of two angles $80 \times 10 \times 6$ mm bolted to opposite sides of 12 mm thick gusset plate using single row of 5 nos. of 20 mm diameter bolts at a distance of 35 mm from toe of the angle. Take pitch as 50 mm and end distance = 40 mm. the length of the member is 4 m. use Fe 410 grade steel. Determine the maximum load that the member can carry. What will be the load carrying capacity if the angles are connected on the same side of the gusset?

13. (a) Calculate the compressive resistance of a compound column consisting ISMB 500 with one cover plate 350×20 mm on each flange and having a length of 5 m. Assume that the bottom of column is fixed and top is rotation fixed, translation free. Take $f_y = 250$ N/mm².

Or

- (b) A steel column ISHB 400 @ 759.3 N/m is subjected to a factored axial load of 2000 kN. Design a slab base plate for the column. Assume that the bearing surfaces of the column and base plate are machined and the concrete footing is of M 20 grade.

14. (a) A simply supported beam of span 3.25 m consists of rolled steel section ISLB 325 @ 422.8 N/m. Determine the design bending strength of the beam, if the beam is laterally unsupported.

Or

- (b) A welded plate girder of span 25 m is laterally restrained throughout its length. It has to carry a load of 80 kN/m over the whole span besides its weight. Design the girder without intermediate transverse stiffness.

15. (a) Design a channel section [shape purlin placed on a sloping roof truss with dead load of 0.15 kN/m² (cladding and insulation), a live load of 2 kN/m² and wind load of 0.5 kN/m² (suction). The purlins are spaced 2 m c/c and of span 4 m, simply supported on a rafter at a slope of 20°.

Or

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