C 3117

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2007.

Sixth Semester

(Regulation 2004)

Civil Engineering

CE 1352 — DESIGN OF STEEL STRUCTURES

(Common to B.E. (Part–Time) – Fifth Semester – Regulation 2005)

Time : Three hours Maximum : 100 marks

Use of IS 800, IS 875 and steel tables are permitted.

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Name the various types of bolted connection?

2. Write the equation for calculating the effective throat thickness of a weld.

3. What do you mean by Tension splices?

4. Write any two specifications for designing of lug angle.

5. How the effective length of column with sway is determined?

6. What are the forces acting on a lacing system?

7. What do you mean by web crippling in beams? Where it occurs?

8. How is the curtailment of flange plate done in a rivetted plate girder?

9. Draw a neat sketch of North light type roof truss.

10. What are the loads to be considered while designing the purlin?

PART B — (5 × 16 = 80 marks)

11. (a) Two plates 12 mm and 10 mm thick are joined by a triple rivetted lap joint, in which the pitch of the central row of rivets is 0.6 times the pitch of rivets in the outer rows. Design the joint and find its efficiency. Take σ_{at} =150 N/mm^2. τ_{vf} =80 N/mm^2 and σ_{pf} =250 N/mm^2.

Or

(b) A bracket carrying a load of 100 kN is connected to column by means of two horizontal fillet welds, of 130 mm effective length and 10 mm thick. The load acts at 70 mm from the face of the column as shown in Fig. 1. Find the throat stress.

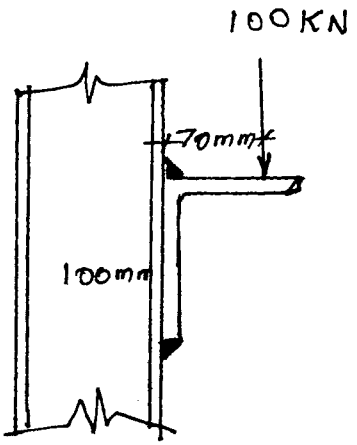

Fig. 1

12. (a) Design a double angle tension member carrying axial tensile force of 300 kN in addition to this, it is also subjected to a uniformly distributed load of 0.4 kN/m throughout its length, including self weight. The center to center distance between the end connection is 2.7 m.

Or

(b) Design a tension splice to connect two plates of size 220 mm × 20 mm and 200 mm × 10 mm, for a design load of 220 kN. Also sketch the details of the rivetted joint.

13. (a) A discontinuous strut consists of two ISA 90 × 75 × 10 mm placed to the same side of a gusset plate 10 mm thick with its longer leg back to back, with one rivet on each angle at the ends. The effective length of the strut is 2.5 m. Determine the allowable load. What is the safe load if the strut is continuous? Take F_y = 250 N/mm^2. The angles are connected with tack rivets along the length.

Or

(b) A built up column consists of ISHB 400 @ 77.40 kg/m with one 300 mm × 12 mm flange plate on each side. The column carries an axial load of 2600 kN. Design a gusseted base, if the column is supported on concrete pedestal with a bearing pressure of 5 N/mm^2.

14. (a) A beam simply supported over an effective span of 7 m, carries an uniformly distributed load of 50 kN/m inclusive of its own weight. The depth of the beam is restricted to 450 mm. Design the beam, assuming that the compression flange of the beam is laterally supported by floor construction. Take $F_y = 250\,N/mm^2$ and $E = 2\times10^5\ N/mm^2$. Assume width of support is 230 mm.

Or

(b) Design a bearing stiffner for a welded–plate girder with the following specifications :

Web = 1000 mm × 6 mm thick

Flanges = 2 Nos. of 350 × 20 mm plate on each side

Support reaction = 350 kN

Width of support = 300 mm.

15. (a) Design the angle purlin for the following specifications :

Span of Truss = 9 m c/c

Pitch = 1/5 of span

Spacing of purlin = 1.4 c/c

Load from roofing materials etc = 200 N/m^2

Wind load = 1200 N/m^2.

Or

(b) Determine the dead load, live load and wind load on a 'FINK' type truss for the following specifications and mark the loads on the nodes of the truss.

Span = 12 m

Pitch = 1/4 of span

Height at eves level = 10 m from the ground

Spacing of the truss = 5 m c/c.