## Z 6408

M.E. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2006.

Second Semester

Structural Engineering

ST 1653 — STEEL STRUCTURES

(Regulation 2005)

Three hours                                    Maximum : 100 marks

Answer ALL questions.

Assume any required data suitably.

Use of IS 800, IS 875 and Steel Tables is permitted.

PART A — (10 × 2 = 20 marks)

What is meant by knee brace?

How to determine the approximate dead weight of a roof truss?

What are the large moment resistant connections?

A butt weld is used to connect two plates 180 mm × 18 mm size each. Determine the stress developed in the weld if it is subjected to a moment of 15 kNm.

Define column factor.

Explain the local buckling of thin elements.

What are the purposes of providing horizontal stays in pressed steel tank?

Write the section modulus of the chimney with no breach openings.

9. Draw the stress-strain curve for a perfectly plastic material.

10. Define plastic hinge.

## PART B — (5 × 16 = 80 marks)

11. (a) Determine the nodal forces in a roof truss shown in Fig. 1 due to dead, live and wind loads. Spacing of the roof truss is 8 m. Dead weight of the roofing sheet is 171 N/m². The wind load normal to the truss is 950 kN/m². (16)
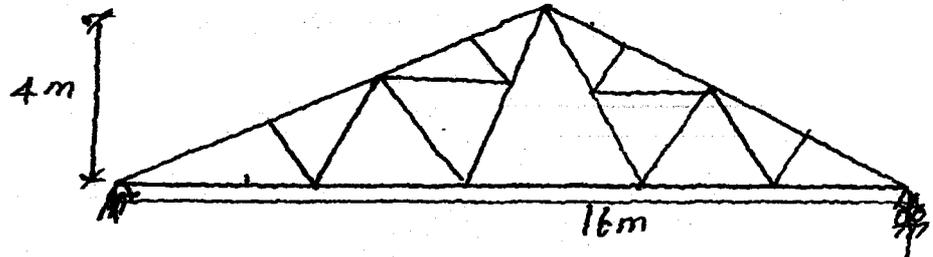


Fig. 1

Or

(b) (i) How do you analyse the fixed base columns in an industrial building? (6)

(ii) Design a gable rafter for an industrial building : (10)

Length of rafter = 9 m

Gable column spacing = 4 m

Number of purlins over truss = 10

Self weight of purlin = 320 N/m

Live load on rafter = 40 kN.

12. (a) An ISLB 400 @ 569 N/m beam transmits an end reaction of 300 kN to the flange of an ISHB 300 @ 588 N/m column. Design a stiffened seated connection with single stiffener angle. (16)

Or

(b) A beam ISLB 500 @ 759 N/m transmits an end reaction 100 kN and a moment of 200 kNm to a column ISHB 300 @ 588 N/m. Design a bracket connection. (16)

Two channel sections back to back with bent libs 200 mm × 80 mm are connected with webs to act as column. The thickness of channel is 3.2 mm. The depth of libs is 25 mm. The effective length of column is 6.5 m. Determine the safe load carrying capacity of column. (16)

Or

Design a Z-shaped beam for a span of 4.5 m to carry a uniformly distributed load of 1300 kN/m. Take $E = 2.03 \times 10^5$ N/mm$^2$.

Design a circular elevated steel water tank for 2.5 lakh litres capacity. Design also the circular ring girder if it is supported on eight columns. Staging design not required. (16)

Or

Design a self supporting steel chimney of 80 m height. The diameter of the chimney at top of 3 m. Thickness of brick lining is 100 mm. Take wind pressure as 1.5 kN/m$^2$. (16)

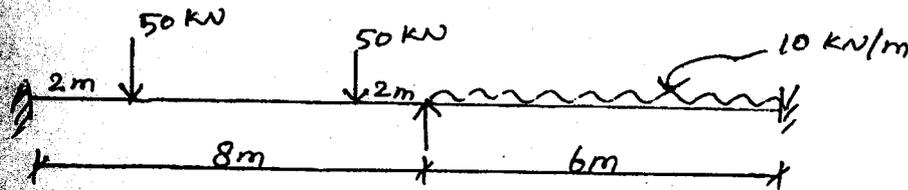Determine the plastic moment for a continuous beam shown in Fig. 2. (16)



Fig. 2.

Or

Design a column to carry an axial load of 1500 kN. The effective length of column is 3 m. (16)

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