

Q 8339

M.E. DEGREE EXAMINATION, MAY/JUNE 2006.

Second Semester

Structural Engineering

ST 1653 — STEEL STRUCTURES

(Regulation 2005)

Time : Three hours

Maximum : 100 marks

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

Assume any required data suitably.

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. How is an industrial building bent analysed, when columns partially fixed at the base?
2. Draw neat sketch of a typical single storey gable frame and list the various components of it.
3. Differentiate the bolted and welded connections.
4. Discuss briefly the principles of semi rigid connections.
5. Bottom tie of a 16 m roof truss is subjected to a tension of 52.5 kN. Design the tie using angle section.
6. Write the principles of semi rigid connections.
7. What are the different types of steel chimneys?
8. What are the advantageous of Z purlins?

9. Define shape factor and load factor.
10. What are the differences between elastic theory of design, plastic theory of design and limit state design?

PART B — (5 × 16 = 80 marks)

11. (i) An elevated rectangular steel water tank, open at top is required to have a capacity of 90,000 litres with a free board of not less than 150 mm. The bottom of the tank is at 10 m above ground level. Using 1.25 m × 1.25 m standard pressed steel plates and suitable allowable stresses, design the staging. (10)
- (ii) How do you compute bending stresses on steel chimney due to wind? (6)
12. (a) The span of knee roof trusses used over an industrial building 28 m long is 20 m. The spacing of roof trusses is 3.5 m. The pitch of roof truss is 1 in 4. The galvanized corrugated iron sheets are used for roof covering. The basic wind pressure is 1.60 kN/m² and there is no snow fall. The height of eaves above ground level is 7.5 m. Design gable column for the industrial building.

Or

- (b) Analyse a gable frame to the following details. Location : at Delhi industrial area plain ground. Wind zone (as per the draft code on wind) = 3

Roof span $L = 16$ m c/c

Bay width $B = 4$ m c/c

Number of span = 1

Number of Bays = 8

Ceiling height = 8 m above floor level

Plinth height = 0.6 m above ground level

Depth of foundation = 1.5 m below ground level.

Rise = 3.2 m

Column height = 8 m

Gantry base = 6 m.

13. (a) A column of ISMB 400 is subjected to an axial load of 750 kN. Design a welded joint between the column and base plate assuming the base plate is 360 × 620 × 25 mm.

Or

- (b) A ISMB 300 bracket is attached to ISMB 400 column with 100 kN on bracket at 350 mm from the face of the column. Design a HT-bolted joint connecting the bracket to the column through cleat angles.
14. (a) Design a laced column member to carry an axial load of 1400 kN and effective length is 6.5 m.

Or

- (b) A roof slab is supported by 6.25 m clear span beams spaced at 3.5 m apart. The thickness of the RCC slab is 100 mm and thickness of the WPT of line terracing with tiles is 90 mm only ISMB 250 with channel sections are available. Design the beam.
15. (a) Determine the value of plastic moment for the frame shown in Figure 1. The plastic moment is uniform throughout.

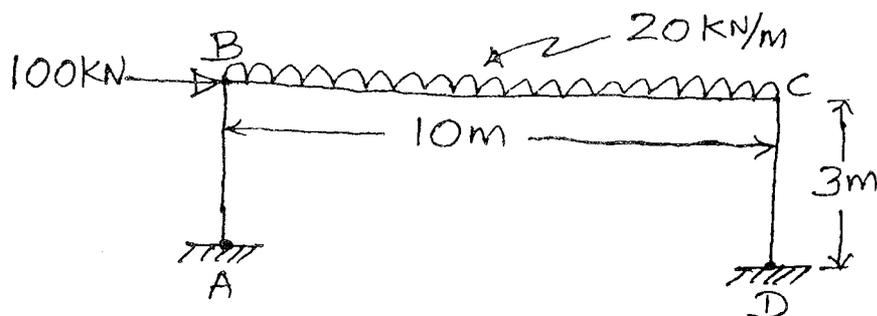


Fig. 1

Or

- (b) Explain the limit state design philosophies of axially loaded members.