| P 7405 |

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

Second Semester

Structural Engineering

ST 143 – STEEL STRUCTURES

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

Use of relevant BIS codes and steel tables are permitted.

PART A — (10 × 2 = 20 marks)

1. What is meant by 'Louver rails'?

2. What is meant by wind bracings?

3. Differentiate between beam to beam connection and beam to column connection.

4. What are the advantages of stiffened connections over unstiffened connections?

5. What is meant by 'Sag of the conductor'?

6. Define the shape, factor.

7. Define and explain about fully plastic moment, M_p.

8. What is meant by 'Plastic hinge'?

9. How is the basic design stress adopted for the design of light gauge steel members?

10. What is function of the form factor in the design of light gauge compression members?

11. (i) The span of knee roof trusses used over an industrial building 28 m long is 20 m. The spacing of roof trusses is 4 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 1.5 kN/m² and there is no snow fall. The height of eves above ground level is 8 m. Propose a suitable type of roof truss. (4)

(ii) For the proposed truss in 11(i), determine the loads at the various panel points due to dead load, live load and the wind load. Determine the reaction also.

(12)

12. (a) A beam, ISWB 550 transmits an end reaction of 280 kN to the web of a column ISHB 250 @ 54.7 kg/m. Design a suitable connection. Use 20 mm dia power driven shop rivets.

Or

(b) A beam ISLB 350, 8 m span, carries a total uniformly distributed load of 300 kN. It is supported on the flange of a column ISHB 200 @ 40.0 kg/m. Design an unstiffened welded seat connection.

13. (a) A steel tower is to be erected for transmission line for a single circuit three phase, 50 Hz to transmit 50 MW at 0.75 power factor for 259 km.

Voltage of transmission = 132 kV;

Power conductor : 30 mm diamet. ACSR (54 strands of 3 mm dia. aluminium and 7 strands of 3 mm dia. of steel)

Unit weight of conductor = 16.76 N/m.

Permissible axial tension = 35.60 kN; $E = 0.842 \times 10^5$ N/mm²

Coefficient of expansion = 0.00001992/°C; Shape factor = 0.67

Ground wire = 10 mm dia. steel; Permissible axial Tension = 25.40 kN

Clearance requirement.

Vertical height of conductor = 6.7m; Vertical spacing = 3.5 m

Horizontal spacing = 6.25 m.

Temperature variation = 5 °C to 60 °C.

Wind = 1.50 kN/m²

Tower : Tangent type with more than 2° line deviation wind span = 240 m.

Determine Geometry of the tower.

(16)

Or

(b) For the Transmission line tower, given in question No : 13 (a) determine

(i) Maximum sag

(4)

(ii) Tension in transmission cable

(12)

(a) A rectangular beam 50 mm × 100 mm, of span 5 m is loaded by a concentrated load at the middle of the span, till the central section becomes fully plastic. Locate the region of yield. Take yield stress = 250 N/mm². The beam is simply supported at its ends.

Or

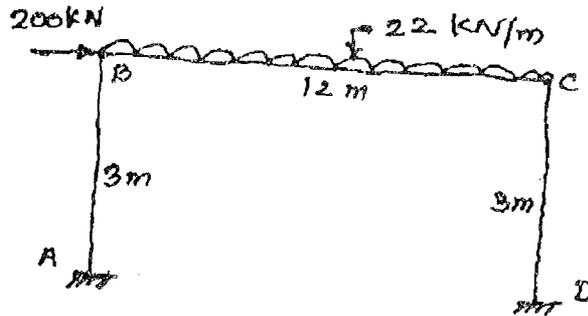(b) Determine the value of plastic moment for the frame as shown in Fig. 1. The plastic moment is uniform throughout.

Fig. 1.

15. (a) A light gauge steel rectangular box section 200 mm × 100 mm × 2.0 mm is used for a column. The effective length of column is 3.60 m. Determine the safe load carrying capacity of the section. Take basic design stress = 125 N/mm².

Or

(b) Two channel sections without bent lips 200 mm × 50 mm are connected with webs to act as a beam. The thickness of channel is 2.5 mm. The effective span of the simply supported beam is 4.00 m. Determine the maximum u.d.l inclusive of the self weigh which can be supported by the beam. The beam is laterally supported throughout its length.

———————