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Question Paper Code : 82310

M.E. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2013.

Second Semester

Structural Engineering

ST 9223/ST 923/UST 9123/10211 SE 203 — STEEL STRUCTURES

(Regulation 2009/2010)

Time : Three hours Maximum : 100 marks

Use of Relevant IS codes and Hand Books are Permitted

Assume any missing data suitably.

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Distinguish between Fillet weld connection and but weld connection.

2. State the types of bolted connections used in Frames.

3. Define Gable columns.

4. State the place where Eaves girder is used.

5. What is meant by staging?

6. Define Lattice.

7. What is meant by web crippling of beams?

8. State Upper bound theorem.

9. Define slenderness ratio.

10. What do you mean by shear leg?

PART B — (5 × 16 = 80 marks)

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

Or

(b) A span of roof truss used over an industrial building 28m long is 18m. The spacing of roof truss is 4m. The pitch of roof truss is 1 in 4. The galvanized Corrugated iron sheets are used for roof cover. Wind Pressure = 1.5 kN/m², no snow fall. The height of eaves above Ground Level is 8m.

12. (a) Design a continuous strut 9m long uses as principal rafter of a roof truss. The loads from purlins are 2kN, 3kN and 4kN at intermediate points. In addition to the above forces the rafters is subjected to a compressive force of 100kN.

Or

(b) Design a seat connection for a factored beam end reaction of 110 kN. The beam section is ISMB 250 @ 365.9N/m connected to the flange of column section ISHB 200 @ 365.9 N/m using bolted connections. Steel is of grade Fe 410 and bolts of grade 4.6.

13. (a) Design forces on tower leg Ultimate Compression: 81,400N, Ultimate lift : 58,250N, Ultimate shear: 2,250N. Tower Data: Base width = 4m, Height = 36m. Site location : Madras. In-situ density $\gamma = 1.79\ kN/m^3$, $\gamma sub = 1.0\ ^{\circ}t/m^3$, $\phi = 32$, Water table at 1.5m below ground level. N corrected for overburden upto 5m depth = 16. Nq = 23, $N\gamma$ = 30. Select a pad footing of size 2.5m x 2.5m at 2.5m depth. Check for uplift.

Or

(b) Design a guyed steel stack for the following data D = 1.4m, H = 30m. Average wind pressure 1.2 kN/m². Assume Initial tension in guy wire as 35 kN/m². Total corrosive allowance is 4.5mm.

14. (a) A uniform beam of length 3L is built up at each end and carries vertical loads W and 2W at the one-third points. If the Plastic moment of the beam is M_p, estimate the value of W for complete collapse.

Or

(b) A portal frame of height L and span 2L, is of uniform section with fully plastic moment Mp. 5 A horizontal load W is applied at the top of the column and another load W is applied at the centre of the beam. Find the value of W at collapse.

15. (a) Find the allowable load for the rectangular tubular column of size 200mm x 120mm of 2mm thickness. The effective length of column is 3.6m. Take $f_y = 235\ N/mm^2$.

Or

(b) Explain in detail about the laterally supported beams with their conditions.