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B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2013.

Sixth Semester

Civil Engineering

080100037 — DESIGN OF STEEL STRUCTURES

(Regulation 2008)

Time : Three hours Maximum : 100 marks

Use of IS 800-2007, IS 883-1994 and steel tables is permitted.

Relevant data may be suitably assumed if found necessary.

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Give the properties (Area/M.I/Section modulus./r_{zz}/r_{yy}) of ISMC 100 using steel table.

2. Define efficiency of a joint.

3. What is the difference between the pitch and a staggered pitch?

4. What is the difference between Purlins and Girts?

5. What is the allowable slenderness ratio for compression members?

6. Define effective length of columns.

7. What is the Imperfection factor for Buckling class "*b*"?

8. Differentiate Gross and Net area.

9. Define Bi axial bending of beams.

10. Sketch the cross-section of a Gantry girder.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Differentiate Lap and Butt joints with neat sketches. (8)

(ii) Define long joint. Give the reduction factor for Long joints, large grip lengths and Packing plates. (8)

Or

(b) A tie member of a truss consisting of an angle section ISA 65 × 65 × 6 of Fe 410 grade is welded to an 8-mm gusset plate. Design a weld to transmit a load equal to the full strength of the member. Assume shop welding. Ref Fig.1. (16)

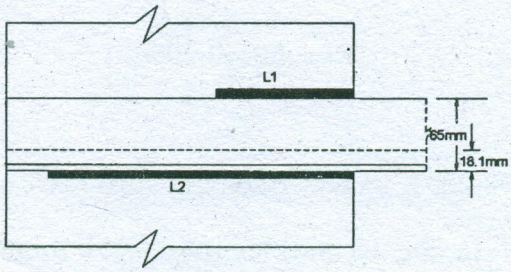

Fig. 1.

12. (a) Determine the tensile strength of a roof truss diagonal ISA 100 × 75 × 6 mm (fy = 250 Mpa) connected to the gusset plate by 4mm welds as shown in Fig. 2. (16)

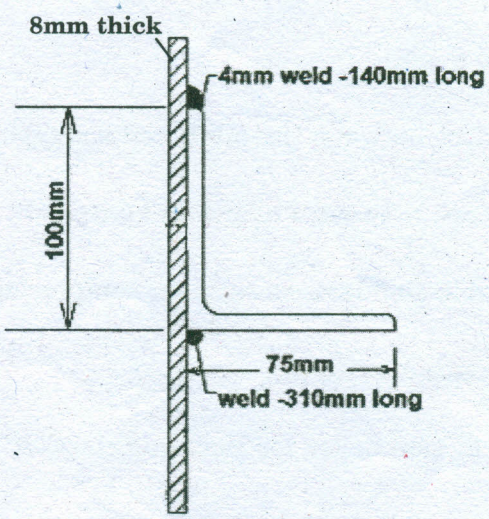

Fig. 2.

Or

(b) A single unequal angle ISA 100 × 75 × 6 is connected to a 10mm thick gusset plate at the ends with six 16mm diameter bolts to transfer tension as shown in Fig. 3. Determine the design tensile strength of the angle assuming that the yield and the ultimate stress of steel used are 250 MPa and 410 MPa.

(i) If the gusset plate is connected to the 100mm leg

(ii) If the gusset plate is connected to the 75mm leg.

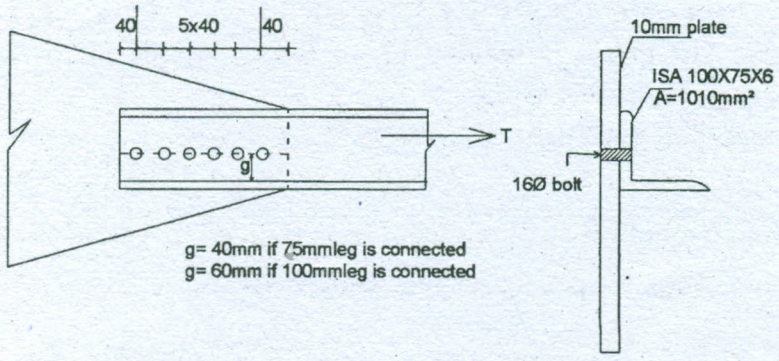

Fig. 3

13. (a) (i) Draw the various cross sections that can be used as compression members.

(ii) Differentiate lacings and battens.

(iii) Define Stress reduction factor.

(iv) Explain the Imperfection factor. (4 × 4 = 16)

Or

(b) Find the design compressive strength of a rolled steel unequal angle section ISA 100 × 75 × 10 mm @ 13 Kg/m as a compression member with center to center length of 1.5m with f_y = 250 MPa, and partial safety factor γ_{mo} = 1.1 Ends are assumed to be hinged. (16)

14. (a) Check the adequacy of ISMB 450 to carry a uniformly distributed load of 24 kN/m over a span of 6 m. Both ends of the beam are simply supported. (16)

Or

(b) A plate girder is used for a span of 22 m.It is subjected to UDL of 42 kN/m. Assuming 2500 mm × 8 mm web plate pairs of ISA 150 × 150 × 15 mm angles and 400mm × 20mm flange plates, design the bearing stiffener at the support. (16)

15. (a) Design the members 1 and 2 in the roof truss shown in the Fig. 4 for the given loading. (16)

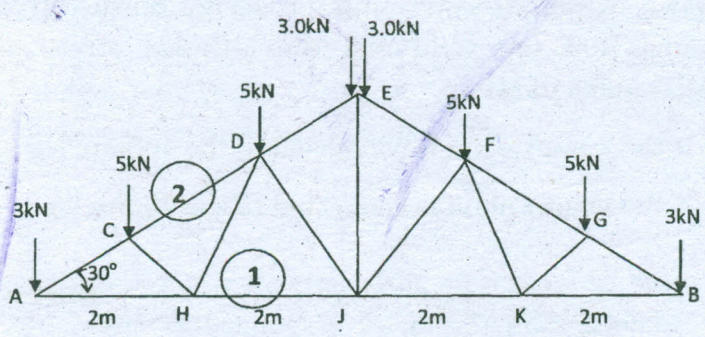

Fig. 4

Or

(b) Design an angle section purlin for a trussed roof from the following data :

Span of the truss = 10 m

Spacing of truss = 4 m

Spacing of purlin along the slope of truss = 2 m

Slope of truss is 1 vertical and 2 horizontal. Wind load on purlin normal to roof is 10 N/m^2. Vertical load from roof covering is 0.2 kN/m^2. (16)