USN

15CV62

Sixth Semester B.E. Degree Examination, Feb./Mar. 2022
Design of Steel Structural Elements

Time: 3 hrs.   Max. Marks: 80

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Use of IS800: 2007, SP6(1) and steel tables is permitted.

Module-1

1 a. What are the advantages and disadvantages of steel structure? **(08 Marks)**
   b. Explain the four classes of section as per IS800-2007. **(08 Marks)**

OR

2 a. Determine the shape factor of a 'T' section having a flange width 200mm and 20mm thick with a web of 10mm thick and 180mm depth. **(08 Marks)**
   b. Identify plastic hinge distance 'X' is 0.414 and from simple support of a propped cantilever beam supporting a UDL of W kN/m over the entire span. **(08 Marks)**

Module-2

3 a. Write a note on HSFG bolts. **(06 Marks)**
   b. Two plates of 10mm and 18mm thick are to be joined by double cover butt joint. Design the joint for the data. Factored design load = 750kN, bolt diameter = 20mm, grade of steel = Fe410 cover plates on each side 8mm, grade of bolts 4.6. **(10 Marks)**

OR

4 a. What are the common defects in welding? Explain briefly with neat sketches. **(06 Marks)**
   b. A tie member of root truss consists of 2ISA 100 × 75 × 8mm and are connected to both sides of 10mm gusset plate, by longer legs. Factored axial load in the member is 500kN. Design the welded joint by providing weld   i) along two parallel sides of angle   ii) along 3 sides of connected angle. Assume shop weld. **(10 Marks)**

Module-3

5 a. Determine design load capacity of a single discontinuous angle ISA 50 × 50 × 5mm used as a compression member in a roof truss connected to gusset by two bolts. Centre to centre distance between end connections is 1.5m. Adopt E250 steel. **(08 Marks)**
   b. Determine the design load carrying capacity of a discontinuous strut 2.50m long comprising of two ISA 70 × 70 × 6mm if connected to same side of 8mm gusset plate by more than one bolt in each angle. **(08 Marks)**

OR

6 a. Mention design specifications for Battening as per IS800-2007. **(04 Marks)**
   b. Design single lacing system for a column of effective length 5m to carry 900kN axial loading. Adopt E250 grade steel. Also design suitable fillet welds. **(12 Marks)**

Module-4

7 a. What is lug angle? Explain briefly with sketch. **(04 Marks)**

b. A single unequal angle ISA $100 \times 75 \times 6$mm is connected to 10mm thick gusset plate with six 16mm ϕ bolts to transfer tension. Determine design tensile strength if longer legs are connected to gusset. Assume pitch and edge distance of 40mm each. **(12 Marks)**

OR

8 a. Briefly explain types of column bases. **(04 Marks)**

b. Design a slab base for a column ISHB 300 @ 58.8kg/m subjected to a service load of 1500kN. The grade of concrete for pedestal is M_{20} and S_{BC} is 180kN/m^2. Design slab base and concrete base with welded connection. **(12 Marks)**

Module-5

9 A floor of hall measuring $9^m \times 21^m$ of 150mm thick R.C. slab supported on steel beams [I section] spaced at 3.5mc/c. The finishing load of floor is 1.5kN/m^2 and live load is 3kN/m^2. Design the steel beam and apply the necessary checks. Assume self weight of beam = 1kN/m and thickness of wall = 0.3m. **(16 Marks)**

OR

10 Simply supported beam ISMB 350@ 52.4 kg/m issued over a span of 5m. The beam carries an udl live load of 20kN/m and dead load 15kN/m. The beam is laterally supported throughout check the safety of the beam. **(16 Marks)**

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