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18CV61

Sixth Semester B.E. Degree Examination, Dec.2023/Jan.2024
Design of Steel Structural Elements

Time: 3 hrs.   Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Use of IS 800:2007, Steel tables or SP6(1) are permitted.
3. Assume missing data suitably.

Module-1

1 a. State any five advantages and three disadvantages of using steel structures. **(08 Marks)**
   b. 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. **(07 Marks)**
   c. Mention the classification of sections as per IS800:2007. **(05 Marks)**

OR

2 a. Define : i) Plastic hinge   ii) Collapse load   iii) Plastic moment. **(03 Marks)**
   b. What are Rolled Steel Sections? Mention any six shapes used as structural elements with sketches. **(07 Marks)**
   c. Find out collapse load for a propped cantilever subjected to a uniformly distributed load/unit length. The plastic capacity of the beam is M_P. **(10 Marks)**

Module-2

3 a. What are the advantages and disadvantages of welded connection? **(06 Marks)**
   b. Explain the advantages of high strength friction grip bolts. **(04 Marks)**
   c. Design a bolted connection for a lap joint of plate thickness 10mm and 12mm to carry a factored load of 150 kW. Use M_{16} and 4.6 grade bolt. Assume the bolts as fully threaded. **(10 Marks)**

OR

4 a. Explain various modes of failures of bolted connections with neat sketch. **(06 Marks)**
   b. Explain the common defects in the welded connection. **(04 Marks)**
   c. Design welded connection for two angles ISA $100 \times 75 \times 8$ mm connected to 10mm gusset with longer legs at its extremities. Design weld for full strength of the member. Assume shop welding size of fillet weld as 6mm. **(10 Marks)**

Module-3

5 Design a compression member using a double channel section back to back to carry a factored load of 1500 kV. The length of the column is 4.5m with one end fixed and other end hinged. Design the battens. **(20 Marks)**

OR

6 a. Explain Laced and Battened columns with sketches. **(08 Marks)**
   b. Determine the design strength of a column section ISHB350@67 kg/m. The column is 3m height with one fixed and other end hinged. Take $f_y = 250$ N/mm^2. **(12 Marks)**

Module-4

7 a. What is lug angle? Explain briefly with a sketch. **(06 Marks)**
   b. A single unequal angle ISA 100×75×6 mm is connected to a 10mm thick gusset plate with six 16mm diameter bolts to transfer tension. Determine design tensile strength if longer legs are connected to gusset. Assume pitch and edge distance of 40mm each. **(14 Marks)**

OR

8 a. Briefly explain types of column bases. **(06 Marks)**
   b. Design a slab base for a column ISHB 300@58.8 kg/m subjected to a service load of 1500 kN. The grade of concrete for pedestal is M20 and SBC of soil is 180 kN/m². Design slab base and concrete base with welded connection. **(14 Marks)**

Module-5

9 Design a suitable joist for a root of a hall 7.5×12 m consists of 100mm thick RC slab supported on steel beams at 3 m apart. The finishing may be taken as 1 kN/m² and live load is taken as 4 kN/m². Self weight of the beam as 1 kN/m. **(20 Marks)**

OR

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

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