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USN

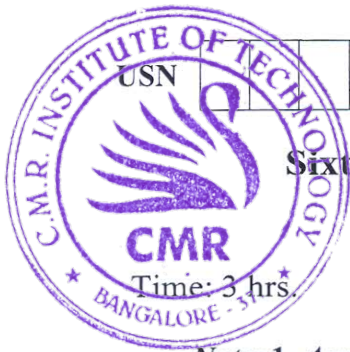**Sixth Semester B.E. Degree Examination, Jan./Feb. 2023**

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 IS:800-2007, steel tables is permitted.

Module-1

1 a. Differentiate between Limit State Method and Working State Method. **(08 Marks)**
   b. Explain different types of loads and load combination. **(08 Marks)**

OR

2 a. Explain the terms: (i) Plastic Hinge   (ii) Collapse Mechanism **(06 Marks)**
   b. Determine the Plastic Moment Capacity and Shape factor for I-section shown in Fig.Q2(b). This section is ISMB400 with root radius omitted. Assume f_y = 250 MPa.
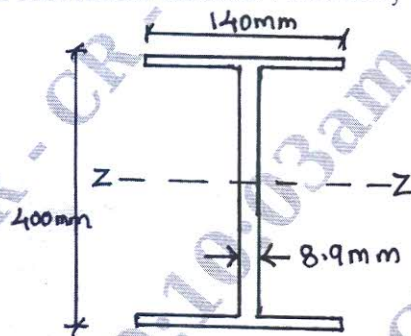

Fig.Q2(b) **(10 Marks)**

Module-2

3 a. Explain briefly High Strength Friction Grip Bolts (HSFG). **(06 Marks)**
   b. Two plates of 16 mm thickness have been connected in a lap joint using HSFG bolts. Design the joint so as to transmit a pull equal to full strength of the plate. Adopt 16 mm diameter bolts. **(10 Marks)**

OR

4 a. What are common defects in welding? Explain briefly with neat sketches. **(06 Marks)**
   b. Design a welded connection for an angle ISA 80 × 80 × 6 mm subjected to a force of 250 kN. Provide 3 sides welding. **(10 Marks)**

Module-3

5 Design a compression member using double channel section "Face to Face" to carry a factored load of 1800 kN. The length of the column is 5 mt with one end fixed and one end hinged. Also design a single lacing system. **(16 Marks)**

OR

6 a. Explain the possible modes of failure of axially loaded columns. **(04 Marks)**
   b. Design a Angle Strut using Single Angle section to carry a load of 150 kN. Use M20 property class 5.6 bolts. The length of member is 2.5 mt. **(12 Marks)**

Module-4

7 Design a gusseted base for a column ISHB200 along with cover plates 250×12 mm on both sides. The column carries an axial factored load of 2000 kN. Use M20 concrete and SBC of soil 200 kN/m^2. Use M20 property class 8.8 HSFG bolts for connection. **(16 Marks)**

OR

8 a. What are lug angles? Explain advantages and disadvantages of using lug angles in bolted connection. **(06 Marks)**

b. Design an unequal single angle section to carry a load of 140 kN in tension. Use M20, 4.6 grade bolts. The length of member is 3 mt. **(10 Marks)**

Module-5

9 a. Write a note on laterally supported beams and laterally unsupported beams. **(04 Marks)**

b. Design a beam of effective span 6 mt subjected to an UDL of 10 kN/m along with 100 kN load at centre of span. The beam is laterally supported. The thickness of wall is 230 mm. **(12 Marks)**

OR

10 A simply supported beam of ISMB350@52.4 kg/m is used over a span of 5 mt. The beam carries an udl live load 20 kN/m and dead load of 15 kN/m. The beam is laterally supported throughout. Check the safety of the beam. **(16 Marks)**

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