

**DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/  
MANAGEMENT/COMMERCIAL PRACTICE, NOVEMBER – 2023**

**STRUCTURAL DESIGN-II**

[Note: - Use of IS 800-2007, IS 875, IS 1905 and steel table are permitted.]

[Maximum Marks: **100**]

[Time: **3 Hours**]

**PART-A**

[Maximum Marks: **10**]

I. (Answer **all** questions in one or two sentences. Each question carries **2** marks)

1. Define gauge distance of the bolt.
2. What you mean by lug angles.
3. Write two types of plate girders.
4. List the types of loads to be considered in the design of steel roof truss.
5. Define plastic hinge.

(5 x 2 = 10)

**PART-B**

[Maximum Marks: **30**]

II. (Answer **any five** of the following questions. Each question carries **6** marks)

1. The strength of a joint in a bolted connection is 620 kN. The size of plate is 180 mm width and 20 mm thick. If the yield strength of material of plate is  $250 \text{ N/mm}^2$  and partial safety factor is 1.1, then the efficiency of the joint is.
2. Determine the design strength due to yielding of gross section single angle member of length 5m to carry axial tensile force of 500 kN. Yield strength  $f_y$  of the material to be considered is  $350 \text{ N/mm}^2$ .
3. Sketch a column with  
(i) Single laced system. (ii) Double laced system. (iii) Battened system.
4. Explain different components of a plate girder.
5. What are the advantages and disadvantages of steel structures?
6. Calculate the live load on the roof truss, if the angle of pitch is  $18^\circ$ .
7. Write the codal provisions for calculating bending strength and shearing strength of laterally supported beams.

(5 x 6 = 30)

**PART-C**

[Maximum Marks: **60**]

(Answer **one** full question from each Unit. Each full question carries **15** marks)

**UNIT – I**

- III. a. Distinguish between bolted joints and welded joints. (7)
- b. Calculate the strength of a 20mm diameter bolt of grade 4.6 for the following cases. The main plates to be jointed are 12mm thick a) Lap joint and b) single cover butt joint, the cover plate being 10mm thick. (8)

**OR**

- IV. a. Write the physical and mechanical properties of steel structures. (7)
- b. Calculate the bolt value of a 20mm diameter bolt of grade 4.6 to join main plates of 12mm thick under Single cover butt joint with cover plate = 10mm thickness. Assume Fe410 for all plates. (8)

**UNIT – II**

- V. a. Design a single angle discontinuous strut to carry a design load of 200 kN,  $f_y = 250$  MPa. The length of strut is 1.5 m, fixity may be fixed. (8)
- b. Write down the steps to design a tension member with code provisions. (7)

**OR**

- VI. a. Write short notes on lacing and battening. (7)
- b. A single unequal angle 100x75x6 mm is connected to a 8mm thick gusset plate at the ends by 4mm welds. The average length of the weld is 225mm. Determine the design tensile strength of the angle if the gusset is connected to the 100mm leg. The yield strength and ultimate strength of the steel used are 250MPa and 400MPa. (8)

**UNIT- III**

- VII. a. Differentiate laterally supported and unsupported beams. (6)
- b. Design a simply supported beam to carry a uniformly distributed load of 20 kN/m the effective span of beam is 6 m. (9)

**OR**

- VIII. a. Determine the design bending strength of a laterally supported beam of ISMB. 300 @ 442 N/m, the yield stress of steel is 250 Mpa. (9)
- b. Write the design procedure of a laterally supported beam. (6)

**UNIT - IV**

- IX. a. Determine the design loads on roof truss for a factory building for a span of 20 m and pitch of 1/5 the height of truss at eave's level is 10m, the spacing of trusses is 4.5 m, the factory building is 36 m long is located at Delhi, provide AC sheeting. (9)
- b. Explain the types of loads acting on truss. (6)

**OR**

- X. A masonry wall carrying axial load of 9.8kN/m is 3.5 effective length. It is not braced by cross walls. The effective height of wall is 2.4m. Design the masonry wall. (15)

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