

**DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/MANAGEMENT/
COMMERCIAL PRACTICE, APRIL - 2024**

STRUCTURAL DESIGN - II

[Maximum marks: 100]

[Time: 3 Hours]

- [Note:- 1. Missing data may be assumed.
2. Use of IS 800-2007, IS 875, IS 1905 and steel tables are permitted.]

PART – A

Maximum marks: 10

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

1. Identify any two mechanical properties of structural steel.
2. Define the term ‘gauge’ with reference to a bolted connection.
3. Define ‘net area’ of a tension member.
4. Define ‘shape factor’.
5. List the various loads acting on a roof truss. (5 x 2 = 10)

PART – B

Maximum marks: 30

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

1. List the advantages and disadvantages of welded connections over bolted connections.
2. Identify the classification of different types of weld.
3. Summarize the codal provisions for the effective length of a compression member for different support conditions.
4. Explain the use of lug angles and its any three specifications.
5. Identify the classification of sections based on plastic analysis in the design of beams.
6. Explain stress reduction factor, shape modification factor, area reduction factor used in the design of masonry walls.
7. State the various components of roof truss and their functions.

(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) List the advantages of steel structures over RCC structures. (5)

- (b) Two flats (Fe 410 grade steel), each 300 mm x 16 mm are to be joined using 20 mm diameter bolts of grade 4.6 to form a lap connection. The connection is supposed to transfer a service load of 375 kN. Calculate the number of bolts required for connection with minimum pitch and end distance for bolts. Assume thread of the bolt does not intercept the shear plane. (10)

OR

- IV. (a) Define (i) pitch (ii) end distance (iii) edge distance related to bolted connection. (5)
- (b) A tie member in a roof truss consists of an ISA 100 x 75 x 10 mm thick connected by a shop fillet weld on both sides of the angle. Design the fillet weld with permissible and ultimate shear stresses are 150 N/mm² and 410 N/mm². (10)

UNIT - II

- V. (a) Define (i) Gross Area (ii) Net area (iii) net effective area of tension members. (6)
- (b) Determine the tensile strength of roof truss member 2 ISA 90x90x6 mm connected to gusset plate of 8 mm thickness by 4 mm weld. Effective length of weld is 200 mm. (9)

OR

- VI. (a) Describe battens used in compression members and their requirements. (6)
- (b) Design a double angle continuous strut carrying an axial load of 150 kN. The length of strut between intersections is 2.4 m, thickness of gusset plate is 12 mm. (9)

UNIT - III

- VII. (a) Differentiate laterally supported and unsupported beams. (6)
- (b) An ISWB 450 @ 794 N/m carries maximum shear force 120 KN, check the safety of the beam in shear with $f_y = 250$ MPa. (9)

OR

- VIII. (a) Explain the different parts of a plate girder and the function of each part. (6)
- (b) A rolled steel beam is designed using an I section for a simply supported beam of span 6 m, carrying a UDL of 15 kN/m over its entire length. The beam is laterally restrained, $f_y = 250$ MPa. Check for safety of beam in shear. (9)

UNIT – IV

- IX.** (a) Report the meaning of the following terms related to a masonry wall.
- (i) effective height
 - (ii) effective length (6)
- (b) A masonry wall carrying an axial load of 12 kN/m is of 3.6m effective length. It is not braced by cross walls. The effective height of wall is 2.8m. Design the masonry wall. (9)

OR

- X.** (a) A roof truss shed is to be built in Lucknow for an industry. The size of the shed is 24 m x 40 m. The height of building is 12 m at eaves. Determine basic wind pressure. (6)
- (b) Design an angle purlin for the following data by simplified method.
- Spacing of trusses = 4m.
 - Spacing of Purlins = 1.6 m.
 - Weight of AC sheets including laps and fixtures = 0.205 kN/m^2 .
 - Live load = 0.6 kN/m^2 .
 - Wind load = 1 kN/m^2 suction.
 - Inclination of main rafter of truss = 21° . (9)
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