

[Total No. of Questions - 9] [Total No. of Printed Pages - 2]

Dec.-23-0545

CE-701 (Limit State Design of Metal Structures)  
B.Tech. 7th (CBCS)

Time : 3 Hours

Max. Marks : 60

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt one question each from Section A, B, C & D. Section E is compulsory. Assume any missing data. Use of IS 800 - 2007 and steel tables are allowed.

#### SECTION - A

- Two plates of 16mm thickness have been connected in a lap joint using high strength friction grip bolts. Design the joint so as to transmit a pull equal to full strength of plate. (10)
- A tie member consists of two MC 225 @ 0.250 kN/m. The channels are connected to either side of a gusset plate 12 mm thick. Design the welded joint to develop the full strength of the tie. The overlap is limited to 400 mm. (10)

#### SECTION - B

- Long leg of an ISA 150 mm × 75 mm is connected to a gusset plate by 20 mm diameter rivets in two rows. The gauge space is 55 mm and the staggered pitch is 40 mm. Determine the thickness of the angle which would be sufficient to transmit a pull of 250 kN. Allowable tensile stress =  $0.6 f_y$ . (10)
- Design a rolled steel beam section column to carry an axial load of 1100 kN. The column is 4m long and adequately restrained in position but not in direction at both ends. (10)

#### SECTION - C

- Design a rolled steel I-section for a simply supported beam with a clear span of 6m. It carries a uniformly distributed load of

2

CE-701

50 kN/m exclusive of self-weight of the girder. The beam is laterally unsupported. (10)

- Design a foundation footing for a column carrying 1530 kN of vertical load along with a moment in the same vertical plane equal to 200 kN/m. The bearing capacity of the soil is 200 kN/m<sup>2</sup>. The width of foundation should not exceed 2m. (10)

#### SECTION - D

- A tubular column consists of IS: 1161 grade St. 40 steel. The column is fixed at both the ends. The outside diameter of the tube is 193.7 mm. The weight of 1m length of tube is 273 N. The length of the column is 3.5 m. Determine the safe load carrying capacity of the column. (10)
- Discuss the following for aluminum structures:-
  - Analysis of tension members.
  - Local buckling of compression members. (2×5=10)

#### SECTION - E (Compulsory)

- Explain the favorable properties of steel for use in structures.
  - Discuss the design approach by Plastic method.
  - Explain the advantages of bolted connections.
  - Discuss the use of stiffeners in plate girder.
  - Explain Euler's theory of effective length in column.
  - Discuss buckling failure in a column.
  - Discuss lateral torsion behavior of unrestrained beams.
  - List the advantages of tubular structures.
  - Explain the crinkling in tubular structures.
  - Discuss the permissible stresses in aluminum structures. (10×2=20)