Roll No. | | | | | | | | | | | | | Total No. of Pages : 03

Total No. of Questions : 09

B.Tech.(CE) (2011 Onwards) (Sem.–5)

DESIGN OF STEEL STRUCTURES–I

Subject Code : BTCE-501

Paper ID : [A2078]

Time : 3 Hrs. Max. Marks : 60

INSTRUCTION TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

1. Write briefly :

a) What is ductility? Under what circumstances does the brittle failure of steel takes place?

b) What is the advantage of stainless steel? What is the main difference in chemical composition between stainless steel and normal mild steel?

c) What are the advantages of Butt Joints over Lap Joints?

d) What are the basic assumptions that are made while deriving the Euler's formula?

e) Under what conditions can a beam member be assumed as laterally restrained?

f) What is the Lap Joint? What is its main advantage?

g) List the hot-rolled steel sections used in practice.

h) What is shear lug? When it is used?

i) What is lacing and its significance?

j) Sketch a braced and unbraced frame and point out the difference in the structural behavior.

SECTION-B

2. Two plates 10 mm and 14 mm thick are to be jointed by double cover butt joint. Assuming cover plates of 8 mm thickness, design the joint to transmit factored load of 300 kN. Assume Fe 410 plate and 16 mm diameter grade 4.6 bolt.

3. A single unequal angle 100 × 75 × 6 mm is connected to a 10 mm thick gusset plate at the ends with six 16 mm diameter bolts to transfer tension as shown in **Figure 1**. Determine the design tensile strength of the angle assuming that the yield and the ultimate stress of steel used are 250 MPa and 410 MPa if gusset plate is connected to the 100 mm leg. Take g = 60mm.

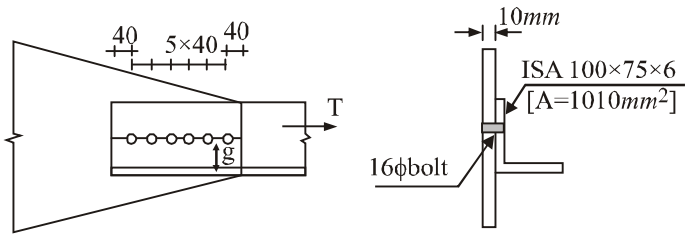

Figure.1

4. Calculate the compressive resistance of a compound column consisting of ISHB 300 as shown in **Figure 2**, with one cover plate of 350 × 20 mm on each flange and having a length of 5 m. Assume that the bottom of the column is hinged and top is rotation fixed, translation free and yield stress of steel is 250 MPa.

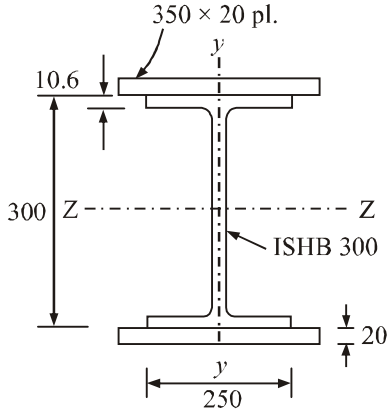

Figure 2

5. Design a base plate for an ISHB 350 column to carry a factored load of 1200 kN. Assuming Fe 410 grade of steel and M 25 concrete.

6. State the difference between purlin and grit. Describe the design of purlin with their load combinations.

SECTION-C

7. Explain with the neat sketch and nomenclature the different types of roof trusses and various load combinations. What are the requirements that are considered while fixing the upper chord slope of trusses.

8. Calculate the maximum value of a mid-span concentrated load 'W' that can be safely applied on a laterally unsupported beam of length 3m. The beam is simply supported at either end and is free to rotate in plane but restrained torsionally at their ends. The beam section is ISMB 250 and the load is applied at the top flange at mid span, F_y of steel is 250 MPa.

9. Design a laced column with two channels placed toe to toe of length 10 m to carry an axial factored load of 1200 kN. The column may be assumed to have restrained in position but not in direction at both ends (hinged). Provide single lacing system with bolted connection. Assume suitable data required.