ASSIGNMENT NO 1

1. What is structural steel? What are the important properties of structural steel.

2. Explain the principles of limit state design?

3 .Distinguish between (i) factor of safety and partial safety factor

(ii)Characteristic loads and design loads

4 .Two plates are joined using M20 bolts of grade 4.6 in

(a) lap joint

(b) Butt joint using 10mm cover plates

Determine the bolt value

5 .List the advantages of welded connections over riveted connections

6. A tie member of a roof truss consists of 2 ISA 100X 75 X8.The angles are connected to either side of a 10mm gusset plates and the member is subjected to a working pull of 300 kN. Design the welded connection. Assume the connections are made in the workshop.

7. A single bolted double cover butt joint is used to connect two plates of 8 mm thickness. Assuming 20 mm bolts at 50 mm pitch. Calculate the efficiency of joint. Use Fe 410 plate and 4.6 grade bolts.

8. Two plates of 200x8 mm of grade 410 are connected by 20mm bolts using butt joint. Design the bolted connection to transmit a pull equal to the strength of the plate. Bolts are of grade 4.6.

9. A bridge truss diagonal carries an axial pull of 300 kN. Two plates of 200 x 10 mm and 200 x 18 mm of the diagonal member are to be jointed together. Design a suitable splice. Assume Fe410 plate and grade of 4.6 bolt of diameter 20 mm.

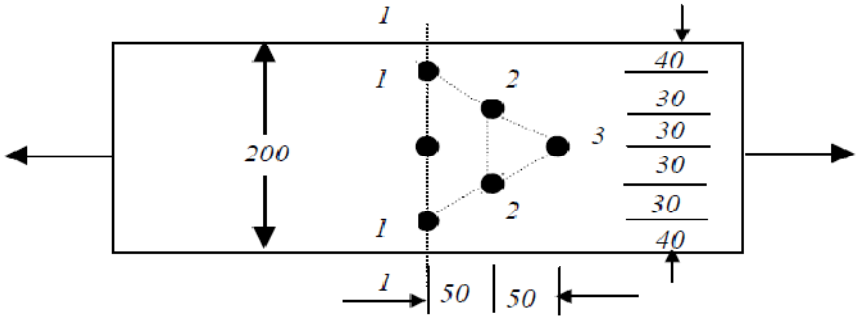
10. Find the efficiency of lap joint connected with two plates of 180x20 mm. these plates are connected with 6 bolts of M20 with 3 bolts in each row. Use 4.6 grade olts with Fe410 grade of plate.

11. A single bolted double cover butt joint is used to connect two plates of 8 mm thickness. Assume 20 mm bolts at pitch of 50 mm calculate the efficiency of the joint. Use Fe 410 grade of plate and 8.8 grade of bolts.

ASSIGNMENT NO 2

1. Determine the design tensile strength of the plate (200 X 10 mm) with the holes as shown below, if the yield strength and the ultimate strength of the steel used are 250 MPa and 420 MPa and 20 mm diameter bolts are used. Take

   $f_y = 250\ MPa$, $f_u = 420\ MPa$



2. Design a single angle section for a tension member of a roof truss to carry a factored tensile force of 225KN. The member is subjected to the possible reversal of stress due to the action of wind. The length of the member is 3m.Use 20 mm shop bolts of grade 4.6 for the connection.

3. Determine the design tensile strength of the plate 120 mm x 8 mm connected to a 12mm thick gusset plate with bolt holes as shown in Fig. 1. The yield strength and ultimate strength of the steel used are 250 MPa and 400 MPa. The diameter of the bolts used is 16 mm.

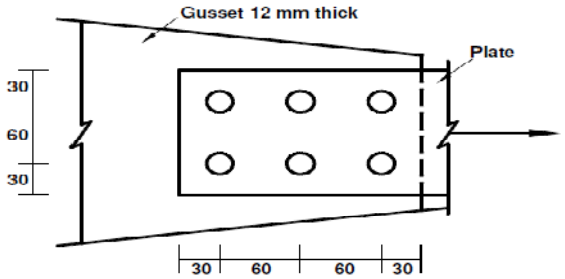


Fig. 1 Details of End Connections

4. What is a lug angle .Why lug angles are used.

5. A single unequal angle 100 x 75 x 8 mm is connected to a 12 mm thick gusset plate at the ends with 6 numbers of 20 mm diameter bolts to transfer tension as

shown in Fig. 2. Determine the design tensile strength of the angle if the gusset is connected to the 100 mm leg. The yield strength and ultimate strength of the steel used are 250 MPa and 400 MPa. The diameter of the bolts used is 20 mm.

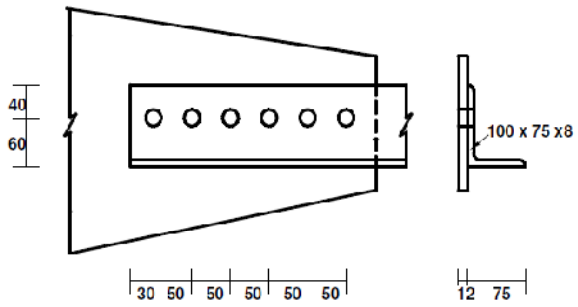


Fig. 2: Details of Connections

6. A tension member of a roof truss carries a factored axial tension of 430 KN. Design the section and the connections using lug angle

7. A column 4m long has to support a factored load of 6000 KN. The column is effectively held at both the ends and restrained in direction at one of the ends. Design the column using beam sections and plates.

8. A tie member in a bracing system consists of two angles 75 x 75 x 6 mm bolted to a 10 mm thick gusset plate one on each side using a single row of bolts and tack bolted. Determine the tensile capacity of the member and the number of bolts required to develop full capacity of the member. The yield strength and ultimate strength of the material is 250 MPa and 410 MPa, respectively.

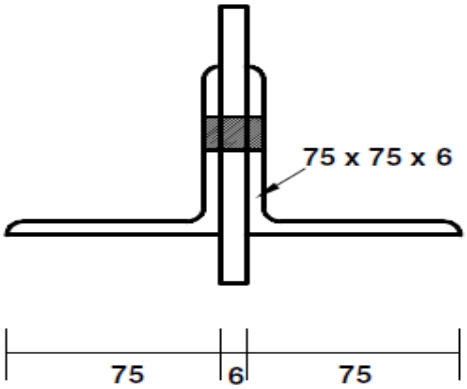


Fig 3: Angles Placed Back to Back

9. Design a laced column with two channels back to back of length 10m to carry an axial factored load of 1400 k N. The column may be assumed to have restrained in position but not in direction at both ends.
10. Design a suitable angle section to carry a factored tensile force of 210 kN assuming a single row of M20 bolts. The yield strength and ultimate strength of the material is 250 MPa and 410 MPa, respectively. The length of the member is 3 m.
11. Design a suitable angle section to carry a factored tensile force of 210 kN assuming a single row of M20 bolts. The yield strength and ultimate strength of the material is 250 MPa and 410 MPa, respectively. The length of the member is 3 m.

ASSIGNMENT NO 3

1. Design a simply supported beam of 9m effective span carrying a load of 40 k N/m. The depth of the beam should not exceed 450 mm. The compression flange of the beam is laterally supported. Assume stiff end bearing is 80mm.

2. Design a beam of 5m effective carrying a udl of span 20 k N/m if the compression flange is laterally unsupported. Assume fy =250 MPa

3. Design a built-up column to carry an axial load of 1200 kN. The length of column is 6.0 m. the column is effectively held in position at both ends and restrained against rotation at other end. Use preferabely channel section. Design appropriate lacing system and connections use f_y=250MPa.

3. Determine the basic wind pressure on a pitched roof near Jabalpur for the following data.

Class of building: General with life of 50 year.

Terrain category: 2

Size of building : 18m x40 m

Height of eve board: 12m

Topography plan area (slope<30)

Permeability: medium

Span of truss: 18m

Pitch ¼

Sheeting: A.C Sheets

Spacing of purlins: 1.4m

Spacing trusses: 5m

ASSIGNMENT NO 4

1. What is plate girder? Where it is used. Explain the various components with neat sketches

2. A plate girder is subjected to a maximum factored moment of 4000 kN and a factored shear force of 600 k N. Design the section with stiffeners.

3. design a welded plate girder for a simply supported beam with clear span of 20 m, subjected the following:
Dead load including self weight= 20 kN/m
Imposed load= 10 kN/m
Two moving loads = 150 kN each spaced 2m apart
Assume that the top compression flange of the plate girder is restrained laterally and prevented from rotating. Use mild steel with fy =250 MPa. Design as an unstiffened plate girder with thick webs.