Assignment No:	**01**	**PHILOSOPHY OF LIMIT STATE DESIGN FOR STEEL**	
Date:	**10/06/2021**		
Sub Code	**3150612**	**Title of Subject**	**DESIGN OF STRUCTURES**

#	Questions
1	What do you understand by limit state of collapse?
2	What is limit state of serviceability?
3	Explain Working stress method and Limit state method of structural Design Philosophy.
4	Discuss advantages and disadvantages of structural steel?

DATE OF SUBMISSION: 21/06/2021

Name of Professor	**Prof. K. A. Mehta**

Assignment No:	**02**	**DESIGN OF TENSION MEMBER**	
Date:	**14/07/2021**		
Sub Code	**3150612**	**Title of Subject**	**DESIGN OF STRUCTURES**

INSTRUCTION:

1. **Use of IS: 800 (2007), IS: 456 (2000) and Steel Table is permitted.**
2. **Assume the Ultimate and Yield stress of steel as 410 N/mm^2 and 250 N/mm^2 respectively unless it is mentioned.**

#	Questions
1	A tension member comprises of the single angle ISA 90 X 60 X 6 mm is connected by 7 nos. of 16 mm diameter bolt to the 10 mm thick gusset plate. Calculate the capacity of the member if shorter leg is connected.
2	A single unequal angle 100 X 75 X 6 mm is connected to an 8 mm thick gusset plate at the ends with 6 bolts 18 mm diameter bolts to transfer tension. Determine the design tensile strength of the angle. Assume that the longer leg is connected to the gusset plate.
3	A single equal – leg angle 100 X 100 X 8 mm is connected to a gusset plate of 10 mm thick at the ends with 5 bolts of 20 mm diameter in a single line at a gauge distance of 60 mm to transfer tensile force. Determine the design tensile strength of the angle.
4	A tension member comprises of the single angle ISA 80 X 80 X 8 mm is connected by 7 nos. of 16 mm diameter bolt to the 10 mm thick gusset plate. Calculate the tensile load capacity of the member. Take edge distance as 30 mm and pitch as 50 mm for bolt connection.
5	What do you mean by "LUG ANGLE"? Design a tension member of a roof truss to carry a factored axial tension of 350 kN using lug angle.
6	Find the tensile strength of an angle section ISA 120 X 80 X 8 mm connected by the gusset plate by 5 mm weld at toe and back.
7	Design a tie member of roof truss subjected to working loads of 80 kN (D.L.) and 120 kN (L.L.). Use double angle section connected back-to-back on either side of gusset 8 mm thick. Use bolted connection. Fy = 250 MPa and fu = 410 MPa for both member and bolt material. What will be the capacity if the angles are connected on the same side of the gusset plate?
8	Design a tension member to carry a factored load of 260 KN. Use single unequal angle section with 6 mm fillet weld used to connect to the gusset plate of thickness 8 mm. Assume length of the member 3.5 m and fu for plate is 410 Mpa.
9	A truss member is analyzed and found that following loads are acting on it. (1) Dead Load = 100 kN (Tension) and (2) Live Load = 75 kN (Tension). If the length of the member is 2.0 m between the connections and is connected to the 8 mm thick gusset plate, design the member comprising of two unequal angle sections longer leg connected to gusset plate. Assume that the member is connected to gusset plate by 7 nos. 16 mm bolts.
10	A truss member is analyzed and found that following loads are acting on it. (1) Dead Load = 100 kN (compression) and (2) Live Load = 75 kN (compression). If the length of the member is 2.25 m between the connections and is connected to the 10 mm thick gusset plate, design the member comprising of Two equal angle sections. Assume that the member is connected to gusset plate by more than 2 nos. of bolts.

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Assignment No:	**03**	**DESIGN OF COMPRESSION MEMBER**	
Date:	**25/08/2021**		
Sub Code	**3150612**	**Title of Subject**	**Design of Structural [Steel]**

#	Questions
1	Explain different end conditions of columns with their effective length
2	What is difference in behavior of short and long compression members?
3	Determine the Compressive strength of a single ISA 80 X 80 X 8 mm @ 9.6 kg/m with the length of member 2.5 m. The ends of the supports are fixed. Assume that the load is applied concentrically to the angle. Take fy = 250 MPa.
4	Determine the Compressive strength of a single ISA 100 X 100 X 10 mm @ 14.9 kg/m with the length of member 3.5 m. The ends of the supports are hinged. Assume that the load is applied concentrically to the angle. Take fy = 250 MPa.
5	Calculate the Compressive strength of a single ISA 100 X 65 X 6 mm @ 7.6 kg/m with the length of member 3.0 m. The ends of the supports are hinged. Assume that the load is applied concentrically to the angle. Take fy = 250 MPa. (i) it is connected by 1 bolt at each end.
6	A double angle discontinuous strut consists of 2 – ISA 75 X 75 X 8 mm placed on the same side of the gusset plate of 10 mm thickness and tack bolted. The length of the member is 3.2 m between the intersections. Determine the compressive strength of the member. Assume Fu 410 MPa and fy 250 MPa. Strut is hinged at both the ends.
7	Design a double angle discontinuous strut to carry a factored load of 300 kN. The length (between intersections) of the member is 3.0 m. The two angles are placed back to back on the same side of gusset plate. Use grade Fe 410 steel.
8	Design a column of I – section in a building subjected to axial factored compressive load of 900 kN. The height of column is 4.5 m with both ends fixed. It is braced in order to prevent buckling about the weaker axis at a half the length of the column.
9	A simple support column has length of 6.0 m between supports. It is

	fabricated form ISMB 550. Calculate the maximum compression working load capacity of the column.
10	An ISMB 500 is loaded by a factored compressive load of 500 kN at the midpoint of the flange. Check the safety of the column if the effective length for both axial and bending is 2.8 m
11	A steel column comprising of two ISMC300 forming a rectangle of 300 X 300 mm. It has total length of 4.5 m and is restrained against both rotation and translation at bottom end and restrained against translation only at upper end. Calculate the maximum factored load that can be applied on the same.
12	Distinguish clearly between Lacing and Battening.
13	A built-up column with 2 ISMC 350, back to back, at spacing of 150 mm, is carrying an axial load of 1000 kN. Length of column is 9 m. It is held in position at both ends but not restrained in direction. Design a suitable double lacing system.
14	A steel column is loaded by a working load of 600 kN. The length of the column is 3.4 m and is restrained against both at the one end and is restrained against translation only at the other end. Design suitable I section for the same.
15	Design a built-up column with two channels toe – to – toe to carry a factored load of 1700 kN. Take the effective length as 5.2 m. Design it as a laced column and also design the lacing.

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Assignment No:	**04**	**CONNECTION OF STEEL STRUCTURES**	
Date:	**25/08/2021**		
Sub Code	**3150612**	**Title of Subject**	**Design of Structures [Steel Section]**

#	Questions
1	What are the advantages of bolted connections over riveted or welded connections?
2	Describe what you understand by class 4.6 and class 8.8 bolts?
3	A member of steel roof truss consists of two angle sections ISA 100 X 100 X 8 mm placed back to back on either side of 8 mm thick gusset plate. The member carries an ultimate tensile load of 190 KN. Design the connection if diameter of bolts provided is 20 mm of product grade 5.6. Ultimate tensile stress in the plate is 410 Mpa.
4	Design a lap joint and butt joint between two plates having thickness 12 mm and 16 mm are connected by a single bolted joint with 20 mm diameter bolts at 75 mm pitch. Calculate the efficiency of the joint. Take fu of plate as 410 MPa and assume 4.6 grade bolts
5	Design a suitable fillet weld to connect a tie plate 100 mm X 8 mm to a 12 mm thick gusset plate. The plate is subjected to load equal to tension capacity of the member. Assume shop welding. Provide only side fillets. Assume Fu 410 MPa and fy 250 Mpa.
6	Two plates of width 200 mm and thickness 10 mm are required to be designed, using welded connection for 100 percent efficiency. Use slot welds if required.

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Assignment No:	**05**	**DESIGN OF FOOTING [SLAB BASE] & DESIGN OF BEAM AND BEAM - COLUMN**	
Date:	**25/08/2021**		
Sub Code	**3150612**	**Title of Subject**	**Design of Structures [Steel Section]**

#	Questions
1	Design a slab base footing for built up column consisting of two ISLC 350 back to back separated by a distance of 180 mm and carrying factored load of 1400 kN. Concrete grade M15 and steel Fe410, Bearing capacity of soil 250 kN/m^2.
2	Determine the maximum uniformly distributed load that can be carried by a laterally unrestrained ISMB 300 simply supported beam of 2.5 m effective length.
3	A simple support beam is laterally supported over the span of 8 m and loaded by a super imposed load of 30 kN/m over the entire span and 100 kN and centre. Design the beam using ISMB section and check for all the safety.

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