Name: **Enrolment No:**	

UPES

End Semester Examination, May 2025

Course: Advanced Design of Steel Structures **Semester: VIII**

Program: B. Tech. Civil Engineering **Time: 03 hrs.**

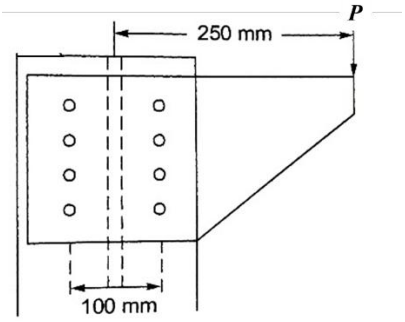
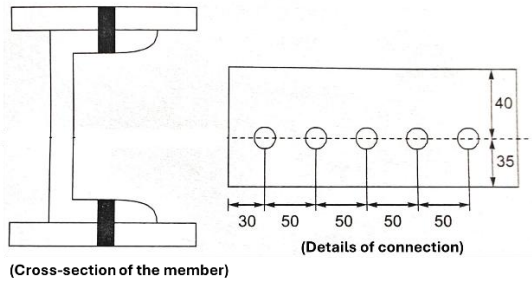
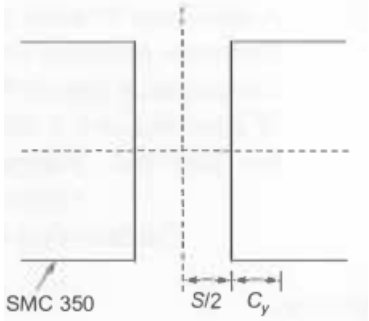
Course Code: CIVL4012 **Max. Marks: 100**

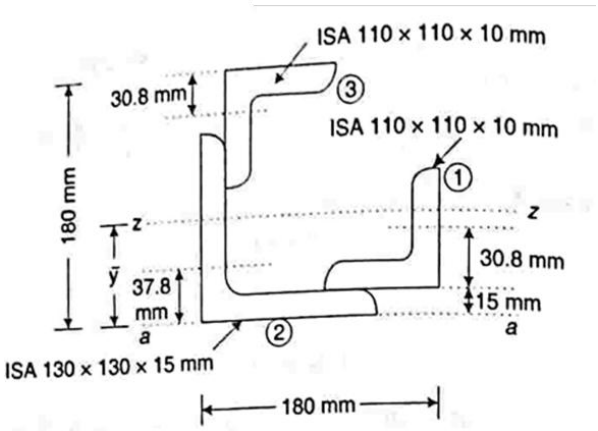
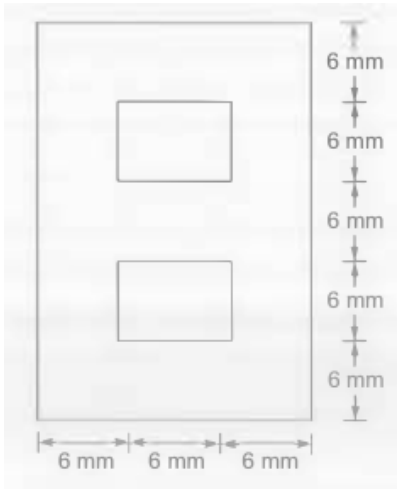
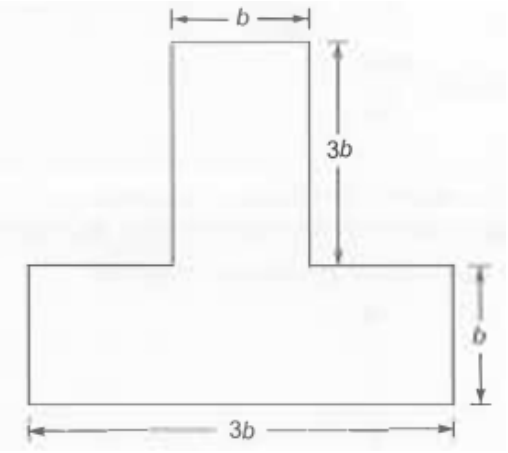
Instructions:

- **Assume suitable values for any missing data.**
- **Unless otherwise specified, assume E250 grade steel and 4.6 grade bolt.**

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q1	Discuss the shape factor and determine the shape factor of a rectangular cross-section.	**4**	**CO2**
Q2	Compression members are more critical than tension members. Comment.	**4**	**CO1**
Q3	Explain the shear lag in tension members.	**4**	**CO1**
Q4	Discuss block shear failure in tension members, and under what circumstances does block shear failure dominate?	**4**	**CO2**
Q5	List 10 commonly used hot-rolled structural steel sections and mention the various modes of failure of bolted connections.	**4**	**CO1**
SECTION B **(4Qx10M= 40 Marks)**			
Q6	Two ISA 75 x 75 x 8 carry a load of 150 kN and are placed back-to-back through a 6 mm gusset plate. Design the bolted connection and show the arrangement of bolts with a neat sketch. **OR** The vertical member of a triangular pratt truss is composed of 2 Nos. ISA 75 x 75 x 6 connected back-to-back on each side of the gusset plate of 10 mm thickness. The factored tensile load in the member is 107 kN. Design the fillet weld connection. Welding shall be done along the length of the member.	**10**	**CO3**
Q7	A bracket plate of thickness 10 mm is connected to a flange of ISMB 500 as shown in the figure below. Find the safe load '*P*' carried by the joint. M16 bolts of grade 4.6 are provided at a pitch of 50 mm and end distance of 30 mm. Assume E250 grade of steel.	**10**	**CO4**

			
Q8	An ISMC 175 is connected to gusset plates through its two flanges by one row of M16 bolts on each flange, with a connection length of 200 mm, as shown in the figure below. Determine the strength of the member against block shear failure. 	**10**	**CO3**
Q9	Two ISMC 350 channel sections are placed back-to-back to form a built-up section for the columns. What will be the minimum spacing 'S so that it will carry maximum compressive load? 	**10**	**CO3**
SECTION-C (2Qx20M=40 Marks)			
Q10	Calculate the safe load over a compression member of unsupported length 4.8 m. The member is to be used in a transmission line tower and is shown in figure below. The ends are held in position but not restrained in direction. The overall section of the member is 180 mm x 180 mm. Use steel of grade E250.	**20**	**CO4**

	 **OR** Design a single angle discontinuous strut to carry a factored axial compressive load of 65 kN. The length of the strut is 3.0 m between the intersections. It is connected to 12 mm thick gusset plate by 20 mm diameter 4.6 grade bolts. Use steel of grade E250.		
Q11	(i) Discuss plastic moment capacity and plastic section modulus. (ii) Determine the shape factor and plastic moment capacity of the following cross-section considering yield stress of steel, f_y = 250 MPa.  (a)  (b)	**4+8+8**	**CO4**