Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII EXAMINATION – SUMMER 2025

Subject Code:3170618 **Date:16-05-2025**

Subject Name:Design of Steel Structures

Time:02:30 PM TO 05:00 PM **Total Marks:70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**
5. **Use of IS 800:2007, IS 1893, IS:875 and Steel table is permitted.**

			MARKS
Q.1	**(a)**	What are the advantages and disadvantages of steel as a structural material?	**03**
	(b)	In what sense the force due to wind and those produced by earthquake on structure are different?	**04**
	(c)	Derive the Resultant force in Bolted Bracket Connection Type II with neat sketches.	**07**
Q.2	**(a)**	Enlist various types of trusses used for truss girders.	**03**
	(b)	Explain the design procedure of Plate Girder.	**04**
	(c)	Determine the shape factors for the following sections: (i) Square of side ***a*** with its diagonal parallel to the zz-axis. (ii) Hollow tube section of external diameter ***D*** and internal diameter ***d***.	**07**
		OR	
	(c)	Find out the collapse load for the cantilever shown in **Fig. 1.**	**07**

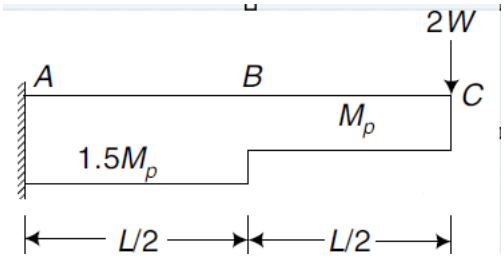

Fig.1

Q.3	**(a)**	Identify the three regions of idealised stress–strain curve of mild steel. Which of these regions is (are) used for limit state design?	**03**
	(b)	Differentiate between surge load and drag load as applied to gantry girders carrying cranes.	**04**
	(c)	Design a bolted bracket connection to support an end reactionof 400 kN because of the factored loads supported by the beam. Theeccentricity of the end reaction is as shown in **Fig. 2**. The steel used isof grade Fe 410. Use bolts of grade 4.6. The thickness of bracket plate may betaken as 10 mm. The column section is ISHB 150 @ 300.19 N/m.	**07**

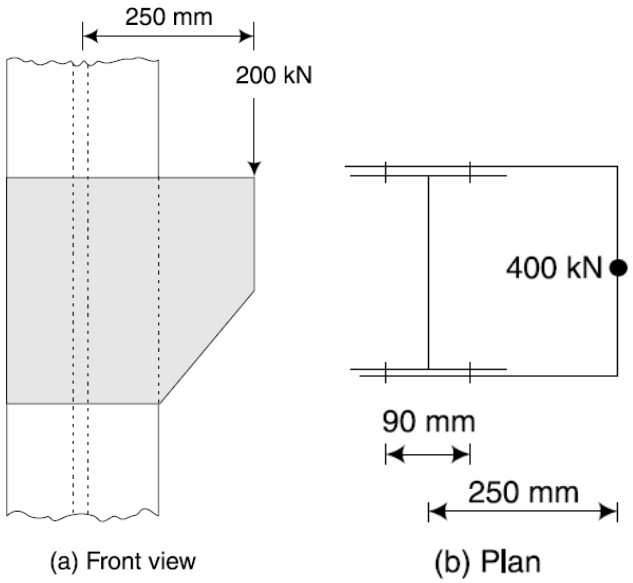

Fig. 2

OR

Q.3	**(a)**	Explain the lower and upper bound theorem of plastic analysis.	**03**
	(b)	Under what circumstances are vertical and horizontal stiffeners provided?	**04**
	(c)	Explain the design procedure for design of Gantry Girder?	**07**
Q.4	**(a)**	What is a difference between beam and plate girder?Why are end posts required in plate girders?	**04**
	(b)	Design a welded plate girder 24 m in span and laterallyrestrained throughout. It has to support a uniform load of 100 kN/m through out the span exclusive of self-weight. Design the girder without intermediatetransverse stiffeners. The steel for the flange and web plates is of gradeFe 410. Yield stress of steel may be assumed to be 250 MPa irrespective of thethickness of plates used. Design the cross section only. Apply suitable check for bending strength only. No shear and torsion checks are required.	**10**

OR

Q.4	**(a)**	What are the components of Truss Girder Bridges?	**04**
	(b)	Analyze a continuous beam ABCD with service loads as shownin **Fig. 3**using plastic analysis approach. The load factor may be assumed to be 1.70.	**10**

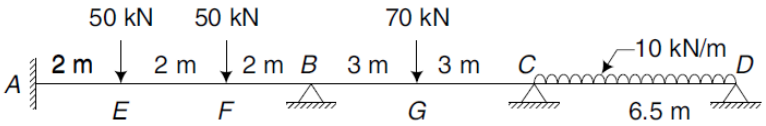

Fig. 3

Q.5	**(a)**	Distinguish between elastic modulus and plasticmodulus.	**03**
	(b)	Explain simple post critical method to calculate nominal shear strength of plate girder.	**04**
	(c)	Design a cross beam for steel foot bridge for the following data: Type of truss: warren type,Span: 21 m , Width of walk way: 4 m, Panel length = 3m, Flooring =RCC slab 125 mm thick. Live Load: 5 kN/m^2& Floor Finish: 1.5kN/m^2.Assume self-weight of cross beam = 0.8 kN/m. Also carry out requiredchecks.	**07**

OR

Q.5 **(a)** Distinguish between static and Kinematic method of plastic analysis. **03**

(b) Explain the following connections with neat sketches: beam to beam web angle connection, beam to column flange seat angle connection **04**

(c) Calculate the design wind pressure and design forces on the hoarding 10 m long and 5m high (as shown in **Fig. 4**), to be fixed at the roof of a 24m high building in densely populated area of Surat. The base of the hoarding board is 2.0m above the roof level. **07**

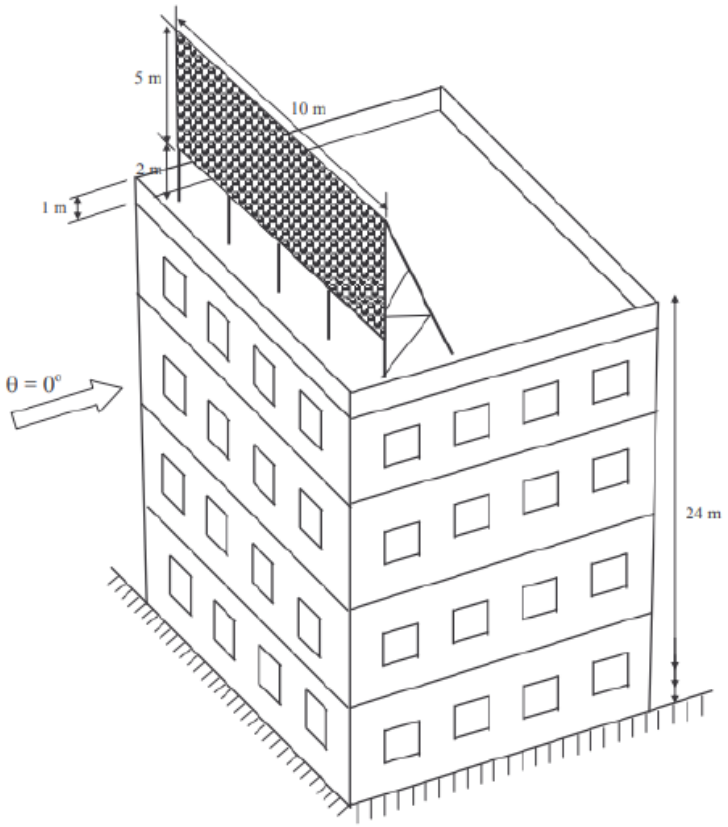

Fig. 4

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