Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III(NEW) EXAMINATION – SUMMER 2023

Subject Code:3130608 Date:03-08-2023

Subject Name:Mechanics of Solids

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.**

			Marks
Q.1	**(a)**	Explain free body diagram with neat sketch.	**03**
	(b)	Write various systems of forces and explain coplanar concurrent force system.	**04**
	(c)	Determine magnitude and direction of resultant force of the force system shown in **Fig.-1.**	**07**
Q.2	**(a)**	Write the assumption made in analysis of truss.	**03**
	(b)	Define shear force and bending moment with sign conventions.	**04**
	(c)	Determine magnitude, direction and position of resultant force of the force system given in **Fig.-2** with reference to point A.	**07**
		OR	
	(c)	Draw shear force and bending moment diagram for the beam shown in **Fig.-3.**	**07**
Q.3	**(a)**	Differentiate in-between centre of gravity & centroid.	**03**
	(b)	Write equation of moment of inertia for rectangular section and triangular section about its neutral axis and base of section.	**04**
	(c)	Determine the centroid of the plane area shown in **Fig.-4.**	**07**
		OR	
Q.3	**(a)**	Write assumption made in the theory of torsion.	**03**
	(b)	Find out radius of gyration for square section. Consider side dimension is **'B'** mm.	**04**
	(c)	Find the moment of inertia about both centroidal axes of Z section as shown in **Fig.-5.**	**07**
Q.4	**(a)**	Write assumptions made in theory of pure bending.	**03**
	(b)	Draw shear stress distribution diagram for hollow rectangular, hollow circle and H section.	**04**
	(c)	Calculate the diameter of the shaft required to transmit 45 kW at 120 rpm. The maximum torque is likely to exceed the mean by 30% for a maximum permissible shear stress of 55 N/mm^2. Calculate also the angle of twist for a length of 2 m. G = 80x 10^3 N/mm^2.	**07**
		OR	
Q.4	**(a)**	Define composite beam and give main objectives of it.	**03**
	(b)	A simply supported beam 300 mm x 600 mm of 6 m. span is subjected to UDL of 15 kN/m throughout the span. Find the maximum bending stress in the beam.	**04**
	(c)	Determine the shear stress at the junction of the flange & web of an **'I'** section as shown in **Fig.-6.** Consider shear force 20 kN.	**07**
Q.5	**(a)**	Define with sketch (i) tensile stress (ii) compressive stress (iii) shear stress	**03**

(b) State Hook's low. Explain stress-strain behavior of mild steel with sketch. **04**

(c) Determine the magnitudes & directions of principal stresses for two dimensional body as shown in **Fig.-7.** **07**

OR

Q.5 **(a)** Explain deformation of uniform bar section under self weight. **03**

(b) Determine change in volume of a steel bar of 100 mm dia. and 500 mm length, when it is subjected to axial pull of 50 kN. Take Es = 200 GPa. & poission ratio 0.25. **04**

(c) Calculate change in volume of a rectangular block 525 mm x 230 mm x 115 mm is subjected to load as shown in **Fig.-8.** Consider poission ratio 0.25 and E is 2 x 10^5 N/mm^2. **07**

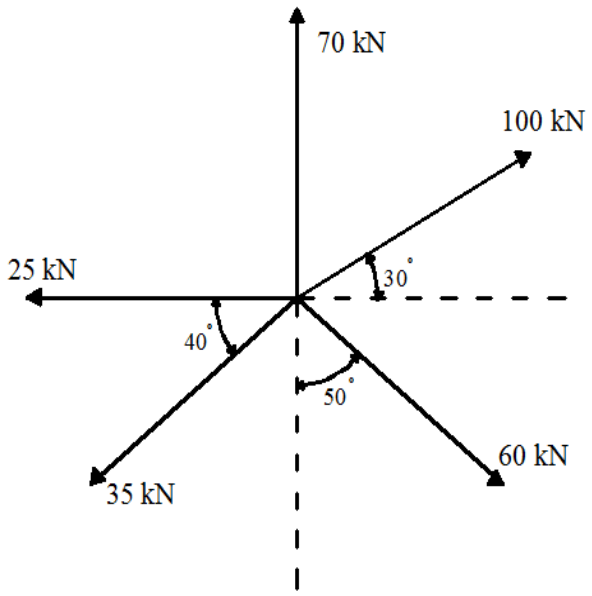

Fig. - 1

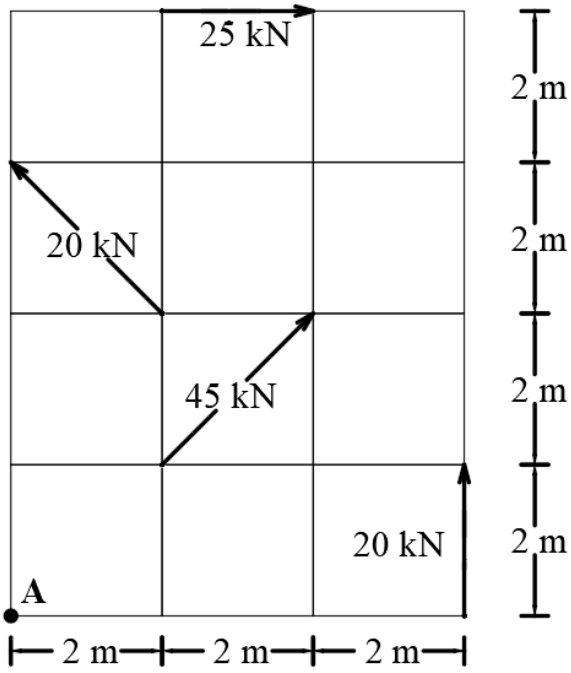

Fig. - 2

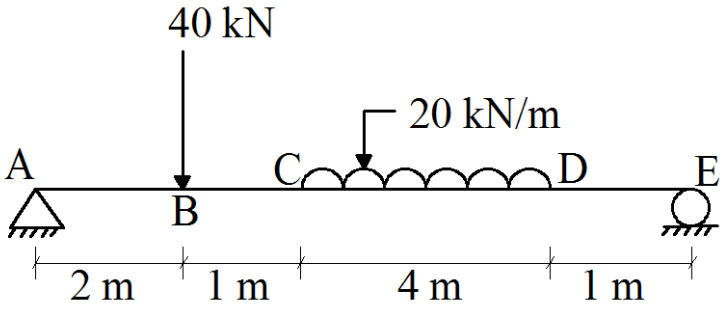

Fig. - 3

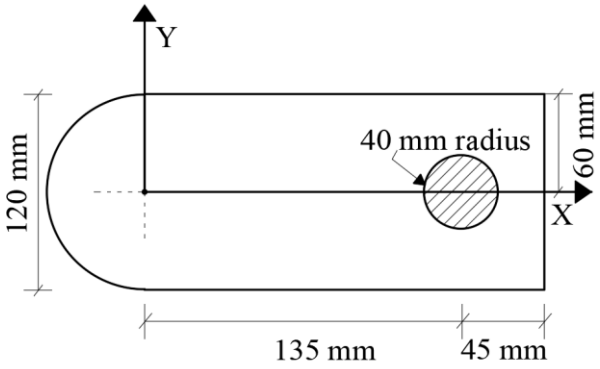

Fig. - 4

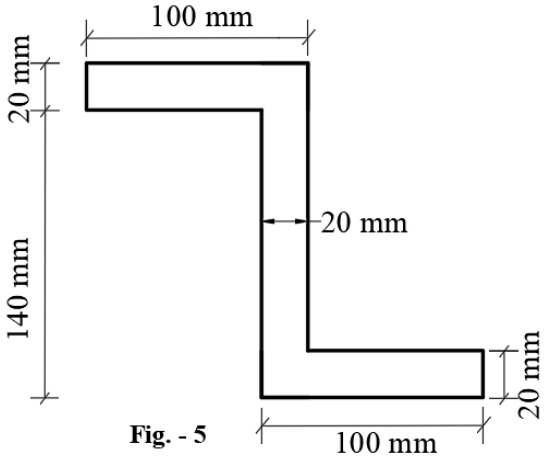

Fig. - 5

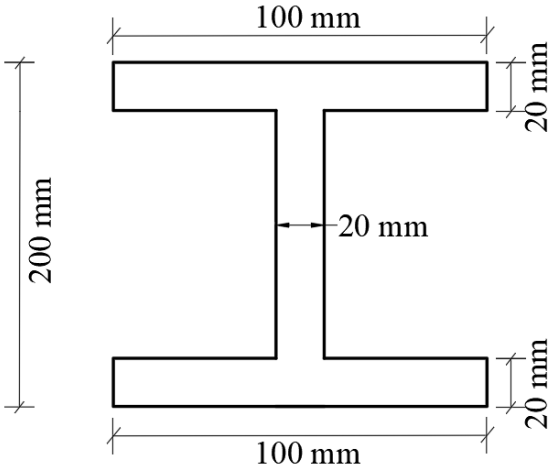

Fig. - 6

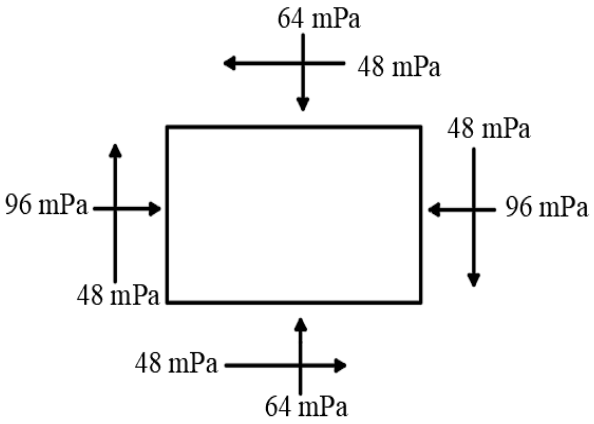

Fig. - 7

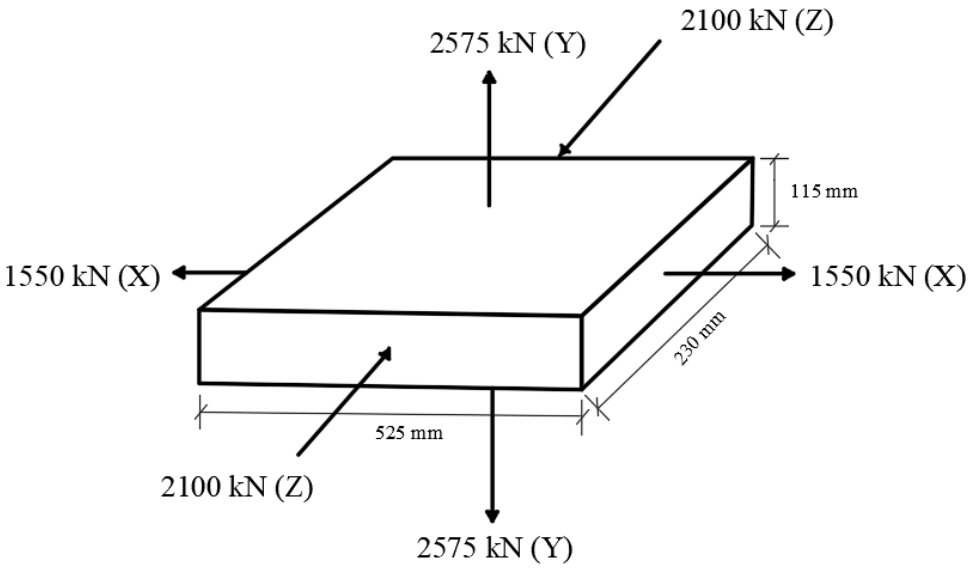

Fig. - 8