Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– III (NEW) EXAMINATION – SUMMER 2022

Subject Code:2130003 Date:11-07-2022

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)**	Define terms: (i) Space (ii) Time (iii) Rigid body	**03**
	(b)	Two forces P=6 N and Q=10 N act on a particle and their line of actions are inclined to each other at angle of 70˚. Find resultant of these forces.	**04**
	(c)	Define: Equilibrant. Find equilibrant of the force system shown in fig.1	**07**
Q.2	**(a)**	Write the assumption made in analysis of trusses.	**03**
	(b)	Distinguish between perfect truss, deficient truss and redundant truss.	**04**
	(c)	Find the resultant of the force system acting on a body OABC as shown in fig. 2. Also find the point where the resultant cuts the X axis.	**07**
		OR	
	(c)	Explain in brief various types of beams and differentiate it in determinate or indeterminate beam.	**07**
Q.3	**(a)**	Define: (i)Shear force (ii) Bending moment diagram (iii) Point of zero shear.	**03**
	(b)	Derive relationship between rate of loading, shear force and bending moment with usual notations.	**04**
	(c)	Find support reaction for the beam shown in fig. 3.	**07**
		OR	
Q.3	**(a)**	Define friction and state the laws of dry friction.	**03**
	(b)	Explain following terms: (i) Angle of friction (ii) Angle of repose (iii) Co-efficient of friction (iv) Limiting friction	**04**
	(c)	Draw shear force and bending moment diagrams for the beam shown in fig.4.	**07**
Q.4	**(a)**	State Pappus-Guldinus theorems and its applications.	**03**
	(b)	List down the assumptions made for the theory of pure bending.	**04**
	(c)	Show that if the coefficient of friction between the block and the plane is 0.25, the force required to just start the block moving up the 40^o incline is $F = 1.38\ W$ while the force required to hold the block from sliding down the plane is $F = 0.487\ W$.	**07**
		OR	
Q.4	**(a)**	Define : (i) Stress (ii) Poisson's ratio (iii) Bulk modulus	**03**
	(b)	A steel bar of length 500 mm has a circular cross section of diameter 50 mm. Determine the change in length if it is subjected to axial pull of 100kN. Take E =200GPa.	**04**
	(c)	Find the moment of inertia of Z-section as shown in fig. 5 about its both centroid axes.	**07**

Q.5 **(a)** Define : (i) Neutral Layer (ii) Section Modulus (iii)Radius of curvature **03**

(b) Draw the shear stress distribution diagram for given shapes **04**
(i) O (ii) L (iii) H (iv) Square

(c) Calculate the total change in length and stresses in each portion for steel bar as shown in Fig. 6. Take E = 200 GPa **07**

OR

Q.5 **(a)** Define : (i) Principle plane (ii) Modulus of rigidity **03**
(iii) Torsional rigidity

(b) State assumption made in theory of torsion. **04**

(c) A short column of 25 mm diameter carries a compressive load of 35 kN. For a plane inclined at 60º with the direction of the load, determine the normal, shear and resultant stresses. Also find the maximum shear stress and obliquity of the resultant stress. **07**

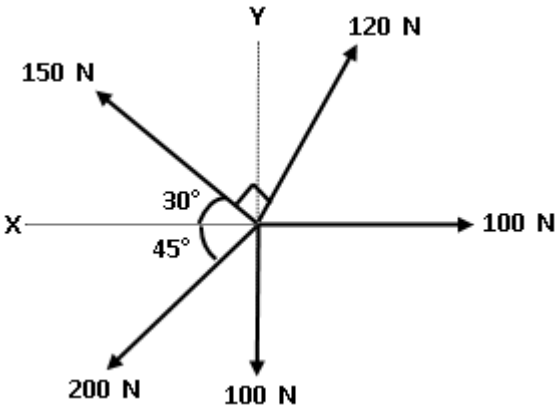

Fig. 1

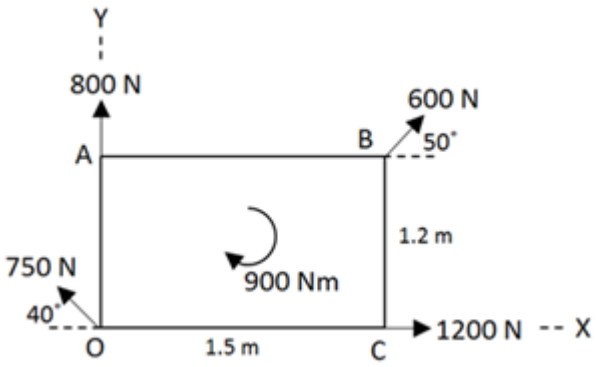

Fig.2

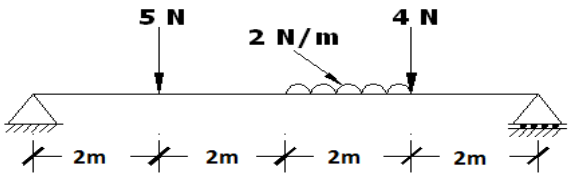

Fig. 3

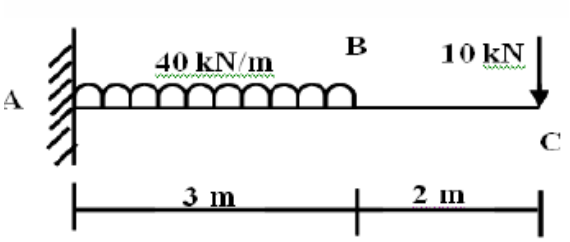

Fig. 4

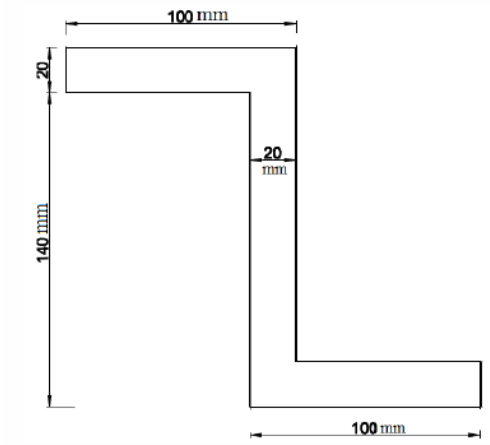

Fig. 5

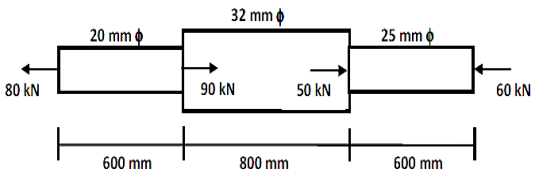

Fig. 6

****