

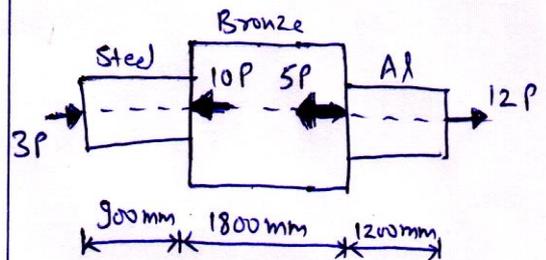
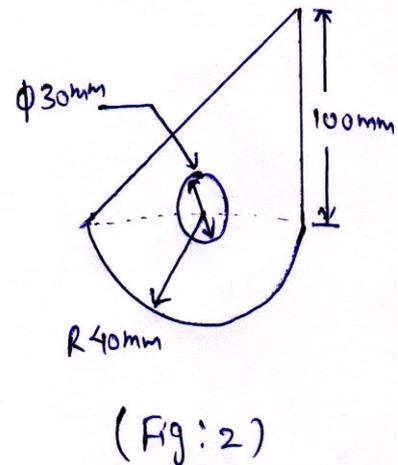
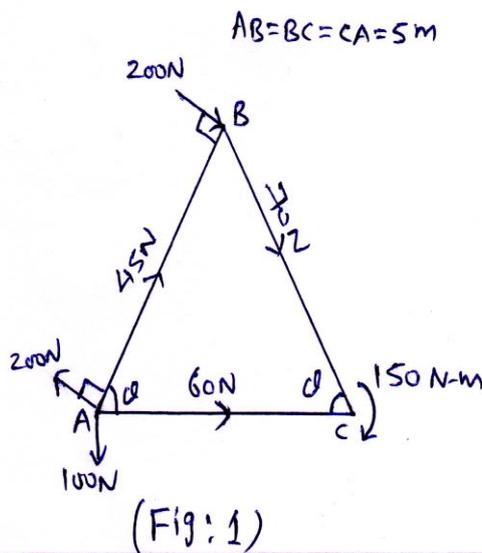
GUJARAT TECHNOLOGICAL UNIVERSITY**BE- SEMESTER-III (NEW) EXAMINATION – WINTER 2020****Subject Code:2130003****Date:09/03/2021****Subject Name:Mechanics of Solids****Time:10:30 AM TO 12:30 PM****Total Marks:56****Instructions:**

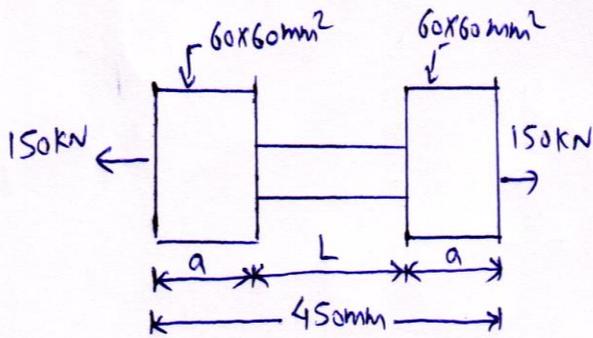
1. Attempt any FOUR questions out of EIGHT questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

		MARKS																	
Q.1	(a) Define (i) Equilibrant (ii) Moment (iii) Resolution of forces	03																	
	(b) State and prove Parallelogram Law of Forces.	04																	
	(c) Find magnitude and direction of resultant of forces system as shown in figure 1.	07																	
Q.2	(a) State Principle of Transmissibility of forces and Principle of Superposition?	03																	
	(b) Determine Center of Gravity. of lamina shown in fig 2	04																	
	(c) Derive equation for I_{xx} and I_{yy} for rectangular section with Base 'B' and Height 'H'.	07																	
Q.3	(a) Define (i) Linear Strain (ii) Lateral Strain (iii) Volumetric Strain	03																	
	(b) Explain Stress-Strain diagram for Ductile Material.	04																	
	(c) A bronze bar is fastened between a steel bar and an Aluminium bar as shown in figure 4. Axial load are applied at the position shown. Find the largest value of 'P' that will not exceed an overall deformation of 4 mm of the following stresses:	07																	
<table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <thead> <tr> <th style="padding: 5px;">Material</th> <th style="padding: 5px;">Stress (MPa)</th> <th style="padding: 5px;">Modulus of Elasticity (E)</th> <th style="padding: 5px;">Area (mm²)</th> </tr> </thead> <tbody> <tr> <td style="padding: 5px;">Steel</td> <td style="padding: 5px;">140</td> <td style="padding: 5px;">200 GPa</td> <td style="padding: 5px;">560</td> </tr> <tr> <td style="padding: 5px;">Bronze</td> <td style="padding: 5px;">120</td> <td style="padding: 5px;">83 GPa</td> <td style="padding: 5px;">750</td> </tr> <tr> <td style="padding: 5px;">Aluminium</td> <td style="padding: 5px;">80</td> <td style="padding: 5px;">70 GPa</td> <td style="padding: 5px;">360</td> </tr> </tbody> </table>				Material	Stress (MPa)	Modulus of Elasticity (E)	Area (mm ²)	Steel	140	200 GPa	560	Bronze	120	83 GPa	750	Aluminium	80	70 GPa	360
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Steel	140	200 GPa	560																
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Q.4	(a) Define (i) Factor of Safety (ii) Allowable Stress (iii) Ultimate Stress	03																	
	(b) Derive equation to find volumetric strain for rectangular bar specimen.	04																	
	(c) The bar shown in fig 5 is subjected to a tensile load of 150 KN. If the stress in the middle portion is limited to 160 N/mm ² , find the cross section dimension of the middle portion. Find also the length of the middle portion if the total elongation of bar is 0.2 mm (the bar had square cross section) Take E=200 GPa and L=2a450 mm.	07																	
Q.5	(a) Define: (i) Bending Moment (ii) Point of Contra-flexure	03																	
	(b) Derive with usual notation the relation between shear force and Bending moment.	04																	
	(c) Determine shear force and bending moment of fig 6. Also draw SFS and BMD.	07																	
Q.6	(a) Define: Angle of Friction and Coefficient of Friction?	03																	
	(b) Derive the Flexure formula for pure bending?	04																	
	(c) Find the minimum value of horizontal force P applied to the lower block that will keep the system in equilibrium as shown in figure 7. The	07																	

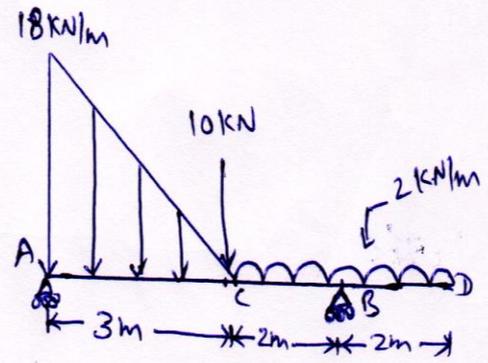
coefficient of friction between the lower block and floor is 0.25, between the upper block and vertical wall is 0.3 and between the block is 0.2.

- Q.7** (a) Define: (i) Moment of Inertia (ii) Radius of Gyration 03
 (b) Explain first theorem of Pappus-Guldinus. 04
 (c) Draw shear force and bending moment diagram for a cantilever which is loaded by transverse load of 400 N, 300 N, 800 N and 500 N at a distance of 0.5 m, 1 m, 1.5m and 2 m from a fixed end shown in fig 8. The total length of cantilever is 2 meter. 07
- Q.8** (a) Write down the assumption made in theory of bending? 03
 (b) Explain Mohr's circle method? 04
 (c) The principal stresses at a point in the section of a member are 100 N/mm^2 and 50 N/mm^2 both tensile as shown in fig 9. Find the normal, tangential and resultant stresses across a plane passing through that point inclined at 60° to the plane having 100 N/mm^2 stress. 07

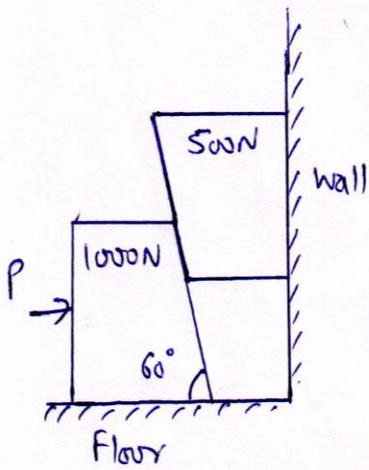




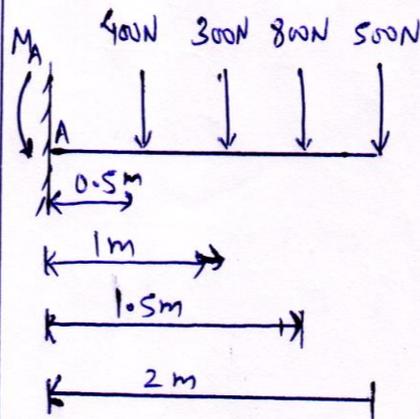
(Fig: 5)



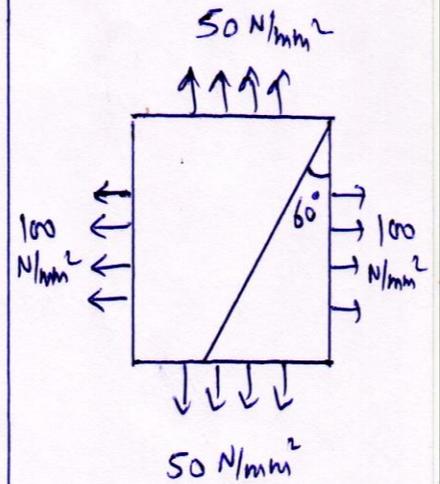
(Fig: 6)



(Fig: 7)



(Fig: 8)



(Fig: 9)