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DEPARTMENT OF MECHATRONICS VII SEMESTER B.TECH. (MECHATRONICS)

END SEMESTER EXAMINATION, NOVEMBER 2022

SUBJECT: SOFT ROBOTICS [MTE 4062]

(Date: NOVEMBER 28, 2022)

Instructions to Candidates:

Time: 180 Minutes

MAX. MARKS: 50

Answer all the questions.

Q. No		Μ	CO	РО	LO	BL
1A.	Sketch neat diagrams of a multigait soft robot. Elaborate the	5	1	1,2	1	3
	fabrication process and analyze about the materials used.					
1 B .	Illustrate with neat diagrams the subtractive Manufacturing		1	1	1	3
	techniques for constructing a functional Soft robot with the help					
	of a relevant example.					
1C.	Briefly explain with a simple block diagram how a physical problem	2	1	1	1	4
	can be solved for a numerical solution using the basic principles of					
	continuum mechanics.					
2A.	Verify the Cayley-Hamilton theorem and use it to compute the inverse	5	1	1,2	1	3
	of A as shown in Eq. 1.1					
	$\mathbf{A} = \begin{bmatrix} 2 & 1 & 0 \\ 1 & 4 & 1 \\ 0 & 1 & 2 \end{bmatrix} $ (0.1)					
2 B .	Explain the relevance of Soft Materials used in Soft Robot	3	1	2,3	1,4	3
	Manipulations. List any 2 soft materials used for fabricating					
	soft robots along with their properties.					

2C.	Explain the working principle and mention the types of material			3,4,5	2,3	3
	used for fabricating textile capacitive sensors					
3A.		5	2	1,2	1	3
	Fig. 1 A soft pneumatic gripper					
	Four bending soft pneumatic actuators prototypes were					
	constructed and characterized using a dedicated test setup,					
	containing a pressure control system. Explain the mechanical					
	properties of the soft pneumatic actuator as shown in the figure					
	1.					
3B.	Describe a polymer-based Sensors. Analyze how does shape	3	3	1	1	4
	memory polymers work? Distinguish the properties of shape					
	memory polymers?					
3C.	Illustrate any of the Dielectric elastomer applications with the	2	1	3,4,5	2,3	3
	help of its working principle.					
4A.	Justify the different classes of soft actuators divided based on	5	2	1,2	1	3
	the stimulation type with the help of a neat chart for soft					
(7)	actuators in soft robots.				-	
4B.	Sketch neat diagrams of a bending actuator. Interpret the	3	1	1,2	1	3
	materials used for constructing and elaborate on the working					
40	principle of PneuNets (pneumatic networks)					
4C.	Briefly explain with a simple block diagram how a physical	2	3	2,3	1,4	3
	problem can be solved for a numerical solution using the basic					
	principles of continuum mechanics.					
5A.	A viscoelastic soft material made of silicon is subjected to	5	3	1,2	1	3
	relaxation test at 40-degree C and 20-degree C. The					

