Reg No.:_______________ Name:__________________________

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Seventh Semester B.Tech Degree Regular and Supplementary Examination December 2021 (2015 Scheme)

Course Code: EC465

Course Name: MEMS

Max. Marks: 100 Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks. Marks

1	a)	With reference to the general stress-strain relations, state the principle stress components and derive the stiffness matrix of Silicon <100>	(10)
	b)	Explain the different boundary conditions and the types of beams with figures	(5)
2	a)	Explain the basis of shape memory effect exhibited by Nitinol with graphs/figures.	(5)
	b)	Compare between Electrostatic sensing and Piezoelectric sensing in micro systems. Illustrate the sensing principle in each of these schemes with figures.	(10)
3	a)	Explain the working principle of micro pumps with relevant figures	(5)
	b)	Explain the pull-in effect of parallel plate actuators. Derive the expression for pull in voltage.	(10)

PART B

Answer any two full questions, each carries 15 marks.

4	a)	By deriving power loss to energy ratio in microsystem justify the following statement. “10 times reduction in size of a power supply system would lead to 100 times greater power loss due to increase of resistivity”	(10)
	b)	Explain the features of Isotropic etching. Why isotropic etching is hardly used for micro manufacturing?	(5)
5	a)	Derive the equations for scaling of heat transfer in convection for fluids in micrometer and sub micrometer regime.	(10)
	b)	Explain Deep reactive ion etching process with neat sketches	(5)
6	a)	By giving the significance of S/V ratio explain scaling in geometry for designing a micro system.	(5)
	b)	Explain chemical vapour deposition process with figures	(10)

PART C

Answer any two full questions, each carries 20 marks.

7	a)	Explain with figures the fabrication of a diaphragm based pressure sensor using bulk micromachining.	(10)
	b)	Explain with figures any three surface bonding techniques.	(10)
8	a)	Discuss the various levels of micro system packaging	(10)
	b)	With necessary diagrams, explain the anodic bonding process	(10)
9	a)	Explain with figures the Micro stereo lithography process. What are its advantages over micromachining techniques?	(10)
	b)	Write a brief note on I. RF MEMS II NEMS	(10)

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