

THE KAVERY ENGINEERING COLLEGE
(An Autonomous Institution)

B.E/B.TECHDEGREE END SEMESTER THEORY EXAMINATIONS, NOV /DEC 2024

Fifth Semester

Electronics and Communication Engineering

CEC340-MEMS Design

Regulations - 2021

Duration : 3 Hrs

Maximum: 100 Marks

PART – A (ANSWER ALL QUESTIONS) (Marks 10*2=20)

<i>Q.No</i>	<i>Questions</i>	<i>BLT</i>	<i>CO</i>	<i>Marks</i>
1.	Draw the stress-strain relation curve for different classes of materials.	AP	1	2
2.	What is flexural stress in a beam?	RE	1	2
3.	List the applications of comb drive devices.	RE	2	2
4.	Consider an air gap capacitor made with two fixed parallel plates. At rest the distance between two parallel plates is 100 mm and the areas of plates are $A = 400 * 400 \text{ mm}^2$. The media between the two plates is air. Calculate the value of the capacitance.	AP	2	2
5.	How does temperature affect the resistance in a thermal resistor?	UN	3	2
6.	Outline the working principle of an infrared sensor.	UN	3	2
7.	Name any four piezo electric materials.	RE	4	2
8.	What principle governs the operation of a cantilever piezoelectric actuator?	UN	4	2
9.	Define magnetization.	RE	5	2
10.	What is the working principle of MEMS magnetic actuators?	UN	5	2

PART – B (ANSWER ALL QUESTIONS) (Marks 5*13 = 65)

<i>Q.No</i>	<i>Questions</i>	<i>BLT</i>	<i>CO</i>	<i>Marks</i>
11.	a Inspect the significance of different crystal planes and orientations of silicon.	AN	1	13
	Or			
	b What is the procedure to calculate the maximum stress in a beam under pure bending and how is the moment of inertia involved in this calculation?	AN	1	13
12.	a With a neat diagram explain the fabrication process of a pressure sensor.	UN	2	13
	Or			
	b Summarize how would you calculate the capacitance value of an interdigitated finger capacitor?	UN	2	13
13.	a Demonstrate the construction and working principle of a bimetallic strip based thermal actuator and discuss its applications.	AP	3	13
	Or			
	b Illustrate the working principle of a thermocouple and how it is used to measure temperature.	AP	3	13

14.	a	How does the electromechanical coupling coefficient influence the efficiency of energy transfer between electrical and mechanical systems in piezoelectric materials?	UN	4	13
		Or			
	b	Describe the working principle of piezoelectric acoustic sensors and explain their applications.	UN	4	13
15.	a	What are the principles and working mechanisms of micromagnetic actuators highlighting their applications and advantages?	UN	5	13
		Or			
	b	Briefly describe the design and fabrication of a magnetic coil.	UN	5	13

*PART – C (Marks 1*15 = 15)*

<i>Q.No</i>		<i>Questions</i>	<i>BLT</i>	<i>CO</i>	<i>Marks</i>
16.	a	Explain how a MEMS system can be modeled as a mass spring damper system. Discuss the significance of the damping coefficient, spring constant and natural resonant frequency in determining the system's behaviour under dynamic input.	AN	1	15
		Or			
	b	Derive the expression for the capacitance of a parallel plate capacitor and discuss how it changes with various parameters.	AN	2	15