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# PRESIDENCY UNIVERSITY

BENGALURU

## Mid - Term Examinations – March 2026

Date: 12- 03-2026

Time: 02:00pm – 03:30pm

<b>School:</b> SOCSE	<b>Program:</b> B. Tech		
<b>Course Code:</b> PHY3002	<b>Course Name:</b> Micro-Electro Mechanical Systems		
<b>Semester:</b> VI	<b>Max Marks:</b> 50	<b>Weightage:</b> 25%	

CO – Levels	C01	C02	C03	C04	C05
Marks	14	12	24	-	-

### Instructions:

- (i) Read all questions carefully and answer accordingly.
- (ii) Do not write anything on the question paper other than roll number.

### Part A

Answer ALL the Questions. Each question carries 2marks.

5Q x 2M=10M

1	Define MEMS and explain its basic working principle with a neat diagram.	2 Marks	L2	C01
2	Explain the concept and importance of miniaturization in MEMS.	2 Marks	L2	C01
3	Define stress and strain in MEMS structures.	2 Marks	L1	C02
4	Explain the batch fabrication technique used in MEMS	2 Marks	L2	C03
5	List the two types of etching used in MEMS fabrication.	2 Marks	L1	C03

### Part B

Answer the Questions.

Total Marks 40M

6.	a.	Define Trimmer Force Scaling Vector. Explain how the Trimmer force scaling vector describes the scaling of force, acceleration, time, and power density during MEMS miniaturization.	5 Marks	L2	C01
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	<b>b.</b>	Estimate the changes in acceleration, response time, and required actuation power when the linear dimensions of a MEMS structure are reduced by a factor of 5.	<b>5 Marks</b>	<b>L2</b>	<b>CO1</b>
<b>Or</b>					
<b>7.</b>	<b>a.</b>	Estimate the associated changes in the acceleration (a), the time (t), and the power supply (P) to actuate a MEMS component if its weight is reduced by a factor of 10.	<b>5 Marks</b>	<b>L2</b>	<b>CO1</b>
	<b>b.</b>	Explain Fluid-mechanics scaling in microchannels and describe how the volumetric flow rate and pressure drop vary with a reduction in channel radius.	<b>5 Marks</b>	<b>L2</b>	<b>CO1</b>
<b>Or</b>					
<b>8.</b>	<b>a.</b>	Explain the basic MEMS structures used in microsystem design and describe the working principles and applications of beams, cantilevers, and membranes.	<b>10 Marks</b>	<b>L2</b>	<b>CO2</b>
<b>Or</b>					
<b>9.</b>	<b>a.</b>	Explain the factors that make silicon the preferred material for MEMS fabrication (any five) and discuss the role of polymers in MEMS technology with suitable examples, listing any three advantages.	<b>10 Marks</b>	<b>L2</b>	<b>CO2</b>
<b>Or</b>					
<b>10.</b>	<b>a.</b>	Explain the thin film deposition techniques and their classification in MEMS fabrication with a neat diagram?	<b>10 Marks</b>	<b>L2</b>	<b>CO3</b>
<b>Or</b>					
<b>11.</b>	<b>a.</b>	Explain the steps involved in the photolithography process used in MEMS fabrication and describe the purpose and significance of each step.	<b>10 Marks</b>	<b>L2</b>	<b>CO3</b>
<b>Or</b>					
<b>12.</b>	<b>a.</b>	Explain the various MEMS manufacturing technologies and compare bulk and surface micromachining in terms of fabrication steps, materials used, and applications.	<b>10 Marks</b>	<b>L2</b>	<b>CO3</b>
<b>Or</b>					
<b>13.</b>	<b>a.</b>	Explain the bonding techniques used in MEMS fabrication and compare anodic bonding and fusion bonding with respect to process conditions, materials, and applications.	<b>10 Marks</b>	<b>L2</b>	<b>CO3</b>