

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: BTECH
BRANCH: CSE/IT/ECE

SEMESTER : VI
SESSION : SP/2024

SUBJECT: EC361 INTRODUCTION TO MEMS

TIME: 3 Hours

FULL MARKS: 50

INSTRUCTIONS:

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
 2. Attempt all questions.
 3. The missing data, if any, may be assumed suitably.
 4. Before attempting the question paper, be sure that you have got the correct question paper.
 5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
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			CO	BL
Q.1(a)	Give a brief history of MEMS development. What were some early MEMS products? Why is silicon the material of choice for MEMS?	[5]	CO1	Remember
Q.1(b)	Explain the two most important patterning techniques in microfabrication, i.e., Photoresist and Photolithography. Derive a scaling law for the ratio of surface area and the volume of a cube and discuss the consequences for MEMS design	[5]	CO2	Apply
Q.2(a)	Accuracy and Precision are two very important attributes of any MEMS sensor. Are these two properties dependent or independent of each other? Explain in detail the difference between these two terms along with examples.	[5]	CO2	Understand
Q.2(b)	Explain how normal stress and strain differ from shear stress and strain. A silicon cube with a volume of 1 cm^3 is placed on a surface. A force of 1 mN is applied vertically on the face. Find (i) the type of stress and (ii) the magnitude of stress induced in the direction of the applied force.	[5]	CO3	Analyze
Q.3(a)	Determine the scaling law for the capacitance of a simple parallel plate capacitor assembly assuming that only the surface area plays any role in determining the net capacitance.	[5]	CO3	Evaluate
Q.3(b)	Explain the four mechanisms for heat to move from one point to another. Write down the governing equations for these mechanisms and explain the various terms involved.	[5]	CO2	Understand
Q.4(a)	Explain why MEMS packaging is difficult as compared to IC packaging. Explain different MEMS integration techniques.	[5]	CO3	Remember
Q.4(b)	What are the different packaging methods used in MEMS design? What are the advantages and disadvantages of each?	[5]	CO2	Understand
Q.5(a)	Explain the working of MEMs blood sensor with suitable diagrams. Why did NovaSense BP meter use double membrane design?	[5]	CO3	Remember
Q.5(b)	Explain the working of MEMS microphones. Why is a cantilever-based design better than a membrane-based design?	[5]	CO3	Understand

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