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BTECH
(SEM VI) THEORY EXAMINATION 2024-25
INTRODUCTION TO MEMS

TIME: 3 HRS**M.MARKS: 70**

Note: Attempt all sections .In case of any missing data; choose suitably.

SECTIONA**1. Attempt all questions in brief.****2x7=14**

QNo.	Question	CO	Level
a.	Define MEMS and list two applications.	1	K1
b.	What is the Piezo resistance effect?	2	K1
c.	State Hooke's Law in the context of beam structures.	1	K1
d.	Explain the term "Moment of Inertia "for a beam.	1	K1
e.	What is viscous flow in the context of air damping?	2	K1
f.	Differentiate between squeeze-film and slide-film air damping.	2	K1
g.	What is the role of fringe effect sin electrostatic cactuation?	2	K1

SECTIONB**2. Attempt any three of the following:****7x3=21**

QNo.	Question	CO	Level
a.	Explain in brief the technique of PVD for MEMS device Fabrication and list their advantages.	1	K2
b.	Derive the expression for the displacement of a cantilever beam under its own weight.	1	K2
c.	Explain Reynolds' equations for squeeze-film air damping and their significance in MEMS.	1	K2
d.	Describe the working principle of a parallel-plate actuator focusing on capacitive sensing.	2	K2
e.	Discuss the design considerations for a MEMS resonator, including one-port modeling.	2	K2

SECTIONC**3. Attempt any one part of the following:****7x1=7**

QNo.	Question	CO	Level
a.	Explain the processes for micromachining in MEMS fabrication, highlighting the role of materials and substrates.	1	K3
b.	Describe the Piezo resistive sensor and its application sin MEMS.	2	K3



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TIME: 3 HRS**M.MARKS: 70****4. Attempt any one part of the following:****7x1=7**

QNo.	Question	CO	Level
a.	Differentiate between bulk and surface micromachining. Explain the role of sacrificial layer in fabrication of MEMS devices.	1	K3
b.	Discuss the mechanics of diaphragm structures in MEMS, focusing on stress and strain distribution	1	K3

5. Attempt any one part of the following:**7x1=7**

QNo.	Question	CO	Level
a.	Derive the basic equations for slide-film air damping and compare the Couette-flow and Stokes-flow models.	2	K3
b.	Explain in brief the effects of air damping on micro-dynamics.	1	K3

6. Attempt any one part of the following:**7x1=7**

QNo.	Question	CO	Level
a.	Discuss the electrostatic force sin a parallel-plate actuator and their impact on mechanical actuation.	1	K3
b.	Explain step voltage driving in electrostatic actuators and discuss the Negative Spring Effect and Vibration Frequency.	2	K3

7. Attempt any one part of the following:**7 x 1 = 7**

QNo.	Question	CO	Level
a.	Describe the working of thermocouples and their application in MEMS thermal sensors.	2	K3
b.	Analyze the limitations of micro mechanical resonator sin RFMEMS applications.	2	K3