

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

**CLASS: M.TECH  
BRANCH: ALL**

**SEMESTER : III  
SESSION : MO/2025**

**SUBJECT: EC601 FUNDAMENTAL OF 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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		<b>CO</b>	<b>BL</b>
Q.1(a)	Explain Intrinsic characteristics of MEMS.	[5]	1,2 2,3
Q.1(b)	Explain briefly the steps required for micro fabrication process.	[5]	1,2,3 2,3
Q.2(a)	i) Consider two parallel planes that are both parallel to the plane formed by the x and z axes. Prove that their Miller Indexes are both (010).  ii) A slender silicon beam is under a longitudinal tensile stress. The force is 1mN, and the cross sectional area is 20 $\mu$ m by 1 $\mu$ m. The Young's modulus in the longitudinal direction is 120Gpa. Find the relative elongation of the beam (percentage).	[3+2]=5]	3,4 2,3
Q.2(b)	What is MEMS system dynamics? Explain. What is the significance of resonant frequency and quality factor in MEMS.	[5]	2,3 3,4
Q.3(a)	What is the basic difference between Micro sensors and actuators? Explain the working principle of cantilever piezoelectric actuator model. Name any two piezoelectric material used in MEMS device.	[5]	3,4,5 2,3,4
Q.3(b)	Explain the concept of comb drive MEMS devices. Mention one of its applications.	[5]	4 2,3
Q.4(a)	What is the role of MEMS Packages? What are different types of MEMS packages? (Name only)	[5]	3,4 4,5
Q.4(b)	Explain the packaging process used for multilayer and multichip.	[5]	4,5 4,5
Q.5(a)	What are the design challenges and considerations required in commercial MEMS based Blood pressure sensor?.	[5]	3,4,5 4,5,6
Q.5(b)	Write short note on MEMS principle used in microphone.	[5]	3,4,5 4.5

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