

Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
**SEVENTH SEMESTER B.TECH DEGREE EXAMINATION(S), MAY 2019**

**Course Code: EC465**

**Course Name: MEMS**

Max. Marks: 100

Duration: 3 Hours

**PART A**

*Answer any two full questions, each carries 15 marks.*

Marks

- |   |  |      |
|---|--|------|
| 1 | a) State five characteristics of micro sensors and actuators   | (10) |
|   | b) With reference to pure bending of longitudinal beam, derive the expression for the magnitude of applied bending moment.                                 | (5)  |
| 2 | a) State a commercial product which uses MEMS technology. Explain with figures its operating principle of the product.                                     | (5)  |
|   | b) Explain the purpose of micro cantilevers in MEMS systems. What is the relevance of spring constant (k) of the mechanical structure in the micro system? | (10) |
| 3 | a) Explain with figures the working principle of micro grippers.   | (5)  |
|   | b) Explain Lorentz force. Explain the operating principle of magnetic actuators with relevant figures.   | (10) |

**PART B**

*Answer any two full questions, each carries 15 marks.*

- |   |  |      |
|---|--|------|
| 4 | a) State the constraints in pumping fluids in micro channels. What pumping scheme is usually used in micro fluidics, give one example. | (10) |
|   | b) State three relevant properties of Silicon Carbide and Silicon Nitride for use in Microsystems.                                     | (5)  |
| 5 | a) With relevant figures/ schematics state one application of Silicon Piezo resistors.   | (5)  |
|   | b) Explain the steps involved in photolithography. State the chemicals used in each of the stages along with the operating conditions. | (10) |
| 6 | a) Explain the oxide growth process in Silicon with relevant figures.  | (5)  |
|   | b) With reference to scaling of electromagnetic forces, derive the expressions for electromagnetic potential energy and force.         | (10) |

**PART C**

*Answer any two full questions, each carries 20 marks.*

- 7 a) Discuss the criteria for selecting materials for the masks used in etching. (5)
- b) Give five relevant points of comparison between bulk and surface micromachining. (5)
- c) What is meant by BioMEMS. Discuss the challenges involved in BioMEMS. List three applications of BioMEMS. (10)
- 8 a) Explain with figure the DRIE and Plasma etching (10)
- b) Explain Anodic bonding and Silicon Fusion Bonding. (10)
- 9 a) Explain the levels of micro system packaging. (10)
- b) Explain with figures two application which use NEMS technology (10)

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