

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

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|---|----|---|------|
| 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.

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|---|----|---|------|
| 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)
