

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

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

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

Seventh Semester B.Tech Degree Examination (Regular and Supplementary), December 2020

**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) Describe the basic building blocks of MEMS with neat diagrams. (8)
- b) Determine the moment of inertia for a beam under longitudinal strain and also find Flexural formula. (7)
- 2 a) Explain the operating principle of Micro pump with suitable schematics. (7)
- b) Explain the working principle of Piezoelectric Sensors and Actuators with one example. (8)
- 3 a) Identify the relation between tensile stress and strain in terms of compliance matrix with the help of stress strain diagram. (8)
- b) State the reasons for intrinsic stress in thin film materials under room temperature .Also explain the different methods for stress compensation. (7)

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

- 4 a) Explain Trimmer Force Scaling Vector. Use scaling laws to estimate the changes in acceleration, time to actuate a MEMS component if its weight is reduced by a factor of 10. (8)
- b) Explain CZ method to produce single crystal Silicon with neat sketches. (7)
- 5 a) With reference to scaling of electrostatic forces, derive the expressions for Electrostatic potential energy and force. (7)
- b) Discuss different types of materials used in MEMS system. (8)
- 6 a) Explain the scaling in heat conducting and heat convection methods. (7)
- b) Explain the oxide growth process in Silicon with relevant figures. (8)

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

- 7 a) Explain with figure the Deep Reactive Ion Etching and Plasma etching processes. (10)

- b) Explain the following bonding techniques with figures (10)  
a) Silicon-on-Insulator b) Wire bonding
- 8 a) Explain the fabrication of a Micro gear using LIGA process with neat sketches. (10)  
b) Discuss the challenges involved in BioMEMS. List two applications of BioMEMS. (10)
- 9 a) Explain the three levels of micro system packaging. (10)  
b) Explain the different stages in the Assembly of micro systems. (10)

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