Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SEVENTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), DECEMBER 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) Explain the basic building blocks of MEMS with neat diagrams. (8)

b) Explain the principle of operation of thermal sensors and actuators with neat diagrams. (7)

2 a) Derive the equation for pull in voltage. Also explain the advantages and limitations of electrostatic actuation methods. (8)

b) Describe the principle of micro-accelerometer with a neat schematic. (7)

3 a) Explain the operating principle of two types of micro motors with suitable schematics (8)

b) Determine the moment of inertia for a beam under longitudinal strain and also find the flexural formula (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 and time to actuate a MEMS component if its weight is reduced by a factor of 10. (8)

b) Explain with figures one method to produce single crystal silicon. Why is silicon used as a substrate material for MEMS. (7)

5 a) With reference to scaling of electrostatic forces explain why electrostatic actuation is preferred over electromagnetic actuation in micro motors. (8)

b) Explain the steps involved in photolithography with neat sketches. (7)

6 a) Explain scaling in fluid mechanics .What are the advantages of piezoelectric pumping. (7)

b) Discuss different types of polymers used in MEMS. (8)

PART C

Answer any two full questions, each carries 20 marks.

7	a)	Explain surface micro machining process for fabricating a mechanical structure with neat sketches.	(10)
	b)	State the objectives and explain the general considerations in micro system packaging	(10)
8	a)	Explain LIGA process in detail.	(10)
	b)	Explain with figures two RF MEMS applications	(10)
9	a)	Explain the three levels of micro system packaging	(10)
	b)	Explain Anodic bonding and Silicon Fusion Bonding	(10)