Reg No.:_____   Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Seventh semester B.Tech examinations (S), September 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)   Explain different types of micro-accelerometers with diagrams.   (7)

    b)   Explain the principle of operation of MEMS based electrostatic sensors and actuators.   (8)

2   a)   Derive the expression for longitudinal strain under pure bending in flexural beams   (8)

    b)   Explain the general stress -strain relationship with neat sketches   (7)

3   a)   Explain the working principle of micro-grippers and micro pumps   (8)

    b)   Explain the operating principle of thermal bimorphs with figures. State any two applications of thermal sensors.   (7)

PART B

Answer any two full questions, each carries 15 marks.

4   a)   With reference to scaling of electrostatic forces, derive the expressions for electrostatic potential energy and force   (8)

    b)   Compare the properties of Silicon, SiO_2 and SiC   (7)

5   a)   Compare different chemical vapour deposition processes.   (8)

    b)   Explain various scaling laws in miniaturization.   (7)

6   a)   Derive equations for acceleration a, time t and power density P/V based on the Trimmer Force Scaling Vector. What inference can a MEMS designer draw from the force scaling vector?   (8)

    b)   Explain two processes used for doping silicon substrate and also specify two n and p type dopants.   (7)

PART C

Answer any two full questions, each carries 20 marks.

7 a) Explain with figures the steps in surface micromachining. Discuss the various   (10)
       fabrication challenges associated with surface micromachining.

   b) Explain the levels of micro system packaging.   (10)

8 a) Explain any two bonding techniques for MEMS   (10)

   b) Explain with diagrams any two applications of RFMEMS.   (10)

9 a) Describe steps of fabrication of a square tube using LIGA process.   (10)

   b) Explain two applications which use NEMS technology.   (10)

****