A **Reg. No. :** | | | | | | | | | | |

Question Paper Code: 59374

B.E./B.Tech. DEGREE EXAMINATION, DEC 2021

Open elective

Civil Engineering

15UEE971 - MEMS

(Common to CSE, ECE, MECH, EIE ,IT and Chemical Engineering branches)

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. _____ defined as a change in electrical resistance of solids when subjected to stress fields. CO1- R

   (a) Piezoelectric (b) Photoresist (c) Piezoresistance (d) none

2. _____defines the change in resistance as a function of the ambient temperature. CO1- R

   (a) TCR (b) Piezoresistance (c) Thermal resistance (d) None

3. The following are /is Characteristics of a mechanical (micro actuator) CO2- R

   (a)Stroke (b) Force/torque (c) Stiffness (d) Hysteresis

4. A piezo-electrical crystal generates voltage when subjected to ____ force CO2- R

   (a) Electrical (b) Mechanical (c) Gravity (d) All of the above

5. To measure force, stress, vibrations ------is used CO3- R

   (a) Voltmeter (b) Seismograph (c) Strain gauge (d) All of these

6. A piezo-electrical crystal generates -------- when subjected to ____ force. CO3- R

   (a) Voltage, Electrical (b) Voltage, Mechanical

   (c) Current, Gravity (d) Current, non electrical

7. The wet etching process is _____ CO4- R

(a) isotropic (b) anisotropic

(c) isotropic for few materials (d) isobaric process

8. In dry etching _____ are used for removing material. CO4- R

(a) solvent etchants (b) gaseous etchants (c) carbide tools (d) powder etchants

9. Which of the following is a thermosetting polymer? CO5- R

(a)polystyrene (b) polyolefins (c) nylons (d) phenolic resins

10. Which among the following polymers have lowest solubillty? CO5-R

(a) polyethylene (b) polystyrene (c) nylon 6 (d) epoxy resin

PART – B (5 x 2= 10 Marks)

11. Define MEMS CO1- U

12. Name the materials used in fabrication of parallel plate sensors CO2- U

13. List piezoelectric materials? CO3- U

14. Define Etching. CO4- U

15. What are the relative merits of optical MEMS devices CO5- R

PART – C (5 x 16= 80 Marks)

16. (a) Describe in general about intrinsic stress in MEMS. CO1- U (16)

Or

(b) Discuss in detail about torsional deflections. CO1- U (16)

17. (a) With neat diagram explain CO2-App (16)
(a) comb drive
(b) Transverse comb drive and
(c) Longitudinal comb drive

Or

(b) With suitable diagram explain the working principle of parallel plate capacitor and also discuss the various application of parallel plate capacitor with regard to actuation and sensing. CO2-App (16)

18. (a) Elaborate and list out the materials used for piezo resistive sensor. CO3-Ana (16)

Or

	(b)	Define the piezo resistive property and then explain the operation of piezo resistive pressure sensor	CO3-Ana	(16)
19.	(a)	Write short notes on isotropic and anisotropic etching process.	CO4- App	(16)
		Or		
	(b)	With neat diagrams explain the different etching processes in detail.	CO4- App	(16)
20.	(a)	Classify about optical MEMS and its applications.	CO5- Ana	(16)
		Or		
	(b)	Explain about different optimal MEMS mirrors/Lenses.	CO5- Ana	(16)