Reg. No. :

Question Paper Code : 40982

28/04/18 AN

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2018
Seventh/Eighth Semester
Electrical and Electronics Engineering
EE6007 – MICRO ELECTRO MECHANICAL SYSTEMS
(Common to : Electronics and Instrumentation Engineering/Instrumentation and Control Engineering/Mechanical Engineering/Mechatronics Engineering/Robotics and Automation Engineering)
(Regulations 2013)

Time : Three Hours　　　　　　　　　　　　　　　　　　Maximum : 100 Marks

Answer ALL questions

PART – A　　　　　　　　　　　　**(10×2=20 Marks)**

1. List the intrinsic characteristics of MEMS.
2. What are the common methods of IC and MEMS fabrication ?
3. Define the role of actuators and sensors in the context of MEMS.
4. What are the functions of interdigitated finger capacitor ?
5. Define electromechanical coupling coefficient.
6. What is tactile sensor ?
7. Define DRIE.
8. Compare bulk and surface micromachining.
9. List the features of polymers used in MEMS.
10. Relate factors involved in the performance of optical MEMS.

PART – B　　　　　　　　　　　　**(5×16=80 Marks)**

11. a) i) Explain the new materials which replace the silicon material in micromachining techniques. **(8)**

ii) Consider a piece of silicon under room temperature and thermal equilibrium. The silicon is doped with boron with a doping concentration of 10^{16} atoms/cm^3. Find the electron and hole concentrations. **(8)**

(OR)

b) i) Discuss on stress strain relationship. **(8)**

ii) Write short notes on torsional deflection. **(8)**

12. a) i) With suitable diagram demonstrate the effect of tangential force on parallel plate capacitor. (8)

ii) Outline the use of thermocouple element with neat diagram. (8)

(OR)

b) i) Analyze the principle of thermal actuators and list the various applications of thermal bimorph. (8)

ii) Derive the equilibrium equations of single sided comb drive. (8)

13. a) i) Explain the principle of Piezo electric pressure sensor. (12)

ii) A longitudinal piezoresistor is embedded on the top surface of a silicon cantilever near the anchored base. The cantilever points in the <110> direction. The piezoresistor is p-type doped with resistivity of 7.8 Ω cm. Find the longitudinal gauge factor of the piezoresistor. (4)

(OR)

b) Discuss on stress in flexural cantilevers. (16)

14. a) Explain the principle of plasma etching. (16)

(OR)

b) i) Explain the LIGA process. (8)

ii) Compare in detail the various sacrificial surface micro machining. (8)

15. a) Discuss on the following : (16)

i) Parylene

ii) PDMS

(OR)

b) Explain the following : (16)

i) Lenses

ii) Micro mirrors.