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B.E / B.Tech (Full Time) DEGREE ARREAR EXAMINATIONS, NOV / DEC 2013

ELECTRICAL AND ELECTRONICS ENGINEERING BRANCH

Sixth Semester

EE 9040 - MICRO ELECTRO MECHANICAL SYSTEMS

(Regulation 2008)

Time: 3 Hours

Answer ALL Questions

Max. Marks 100

PART – A (10 x 2 = 20 Marks)

1. Why electrostatic MEMS device are superior than electromagnetic MEMS devices?
2. What is called anisotropic etching process?
3. Specify the use of Silicon Nitride in MEMS technology?
4. What are the mechanical problems associated with surface micromachining?
5. Determine the energy stored in a parallel plate capacitor when 10 Volts is applied to it. The two plates have dimensions of $L = W = 1000 \mu\text{m}$ and $d = 3 \mu\text{m}$ with air as the dielectric medium.
6. What is the principle of a thermal bimorph device?
7. How an ink-jet printer pumps ink out of its chamber?
8. Pictorially show how actuation takes place in a thermal micro actuator.
9. What are micro arrays and where it could be applied?
10. Define Coriolis force that is developed in gyroscopes and how it can be accounted.

PART – B (5 x 16 = 80 Marks)

11. a). Briefly discuss the bulk micromachining technique of MEMS fabrication process. [8]
11. b). Write short notes on LIGA process. [8]
12. a). With example explain the polysilicon based surface micromachining. [16]

OR

12. b). Explain the principle of operation of micro motors with respect to both linear and rotary motions and specify a practical application for it. [16]

13. a). Discuss in detail about (i) accelerometer as crash sensor and (ii) micro needle as biosensor. [16]

OR

13. b). Write short notes on any two thermal sensors. [16]

14. a). Enumerate the working principle of (i) microvalves and (ii) micropumps. [16]

OR

14. b). Explain how the MEMS devices work using (i) piezo electric actuation and (ii) electro static actuation. [16]

15. a). Explain the working principle of 3D electromagnetic actuators and show how it is utilized in the field applications. [16]

OR

15. b). Discuss in detail the principle of operation of RF electronic devies. [16]