

Exam.Code:0932
Sub. Code: 6927

1108
B.E., (Electronics and Communication Engineering)
Eighth Semester
EC-814: MEMS and Microsystems

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Unit.

x-x-x

- I. Attempt the following:-
- Define MEMS and microsystems.
 - Compare actuation principles: Electrostatic and Piezoelectric.
 - Write four important properties of silicon as substrate material for MEMS.
 - Write an two differences between *erfc* and Gaussian profile of diffusion.
 - Explain in short about mechanical stresses experienced by surface micromachined MEMS devices. (5x2)

UNIT - I

- II. a) Write a comparison between microelectronics and Microsystems.
b) Discuss the scaling laws in electrostatic forces. (2x5)
- III. a) Name the three principal signal transduction methods for micro-pressure sensor. Provide at least one major advantage and one disadvantage of each of the three methods.
b) Estimate the number of atoms per cubic centimeter of pure silicon. (2x5)
- IV. a) Estimate the associated changes in the acceleration 'a', time 't' and the power supply to actuate MEMS component if its weight is reduced by a factor of 10.
b) Discuss the working principle of an accelerometer. How microaccelerometer is different from macro-accelerometer. Also sketch the schematic structure of a microaccelerometer. (4,6)

P.T.O.

(2)

UNIT - II

- V. a) Explain the process of thermal oxidation for the growth of an oxide layer over silicon substrate.
- b) Explain the difference between bulk and surface micromachining with the help of an example. (2x5)
- VI. a) Discuss the various steps involved in the production of a microcantilever structure with the help of surface micromachining.
- b) Discuss the process of etching with respect to three principal planes of silicon substrate. (7,3)
- VII. a) Discuss the various design constraints for MEMS & Microsystems.
- b) What is the principle sources of intrinsic stresses induced in the microsystems? (7,3)

x-x-x