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Total No. of Pages : 02

Total No. of Questions : 08

M.Tech. (ECE) EL-V (2018 Batch) (Sem.-3)

MEMS and NEMS

Subject Code : MTEC-PE5A-18

M.Code : 76584

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. Attempt any FIVE questions out of EIGHT questions.
2. Each question carries TWELVE marks.

- Q1 a. Explain the various steps involved in the fabrication of a cantilever structure.
- b. Explain the key process involved in photolithography with necessary sketches.
- Q2 a. What do you mean by bistability of a MEM Switch? Explain the working of magnetic MEM Switch with the help of schematic diagrams.
- b. A parallel-plate structure has plate areas of $A = 10 \mu\text{m} \times 50 \mu\text{m}$, inter plate distance of $d = 2 \mu\text{m}$, and air ($\epsilon_r = 1.0$) as dielectric. Calculate its capacitance. If it sustains a potential difference of 10V. Calculate the energy stored in its electric field.
- Q3 a. How are the following materials deposited using chemical vapor deposition method? Explain :
- i. Polysilicon
 - ii. Silicon Dioxide
 - iii. Silicon Nitride
- b. What is the significance of using SOI MEMS process? With the help of schematic diagram, describe the SOI MEMS process.
- Q4 a. With the help of appropriate schematic diagrams, explain the process steps for IC fabrication using both types of resists.

- b. Draw the schematic diagram of transmission line cantilever beam switch. Also discuss the pictorial representation of following switch specifications :
 - i. Transition time
 - ii. Switching speed
 - iii. Feedthrough
 - iv. 1-dB compression point
 - v. third-order intercept point.
- Q5 a. Write a short note on :
 - i. Phase Shifters
 - ii. Resonators
- b. What do you mean by Degree of Freedom? Discuss briefly its types.
- Q6 a. With the help of circuit diagram, explain FBAR Voltage-Controlled Oscillator Circuits.
- b. What do you mean by stereolithography? Draw the labelled diagram for conventional “IH” process for stereolithography.
- Q7 a. Draw the labeled schematic diagram for microshield transmission line geometry. Also explain its working.
- b. What do you mean by chemical vapor deposition? Explain and differentiate its various categories?
- Q8 a. For the electrostatic Series Cantilever Beam MEM Switch, explain :
 - i. Switch Operation
 - ii. Switch Fabrication (with process flow diagrams)
- b. Explain the key process involved in photolithography with necessary sketches.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.