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10NT751

Seventh Semester B.E. Degree Examination, Dec.2016/Jan.2017
MEMS and NEMS

Time: 3 hrs.

Max. Marks:100

Note: Answer FIVE full questions, selecting at least TWO questions from each part.

PART – A

- 1 a. Why miniaturization is important? Differentiate between MEMS and NEMS. (05 Marks)
b. Explain the process of IC fabrication steps and also mention the advantages and disadvantages of IC's. (10 Marks)
c. What are micro-sensors? How the sensors are classified and also explain about mechanical sensors? (05 Marks)
- 2 a. Explain the principle of sensing and actuation with an example. (08 Marks)
b. How silicon capacity sensor and Piezo-resistive sensor work explain briefly. (07 Marks)
c. Write a short note on Piezo-ink jet printer. (05 Marks)
- 3 a. Mention the different types of Etching methods and explain briefly with the neat schematic. (09 Marks)
b. Explain CVD technique for depositing thin film with a neat sketch. (07 Marks)
c. What is lithography? Mention different types of lithography techniques and how they are classified. (04 Marks)
- 4 a. Mention different types of MEMS materials used for fabrication of MEMS device and explain briefly. (10 Marks)
b. Write a short note on thin film fabrication, thermo mechanical stress analysis, interfacial fracture analysis. (10 Marks)

PART – B

- 5 a. Explain in detail about sensing mechanism of DNA sensors along with their importance and applications. (08 Marks)
b. Write a short note on chemo-capacitors and chemo-transistors. (07 Marks)
c. Explain briefly about surface acoustic wave (SAW) sensors. (05 Marks)
- 6 a. Describe briefly about reliability and failure mechanisms of MEMS devices. (10 Marks)
b. Explain in detail about transient properties and scaling effects of MEMS devices. (10 Marks)
- 7 a. Explain how DNA used as functional template for nano circuiting. (08 Marks)
b. Write a note on a DNA-protein conjugates in micro array technologies. (08 Marks)
c. Write a short notes on Bio-material nano-particles used bio-electronic and bio-sensing application. (04 Marks)
- 8 a. Explain the process involved in fabrication of NEMS. (08 Marks)
b. Write a note on :
i) Nano imprint lithography ii)Stencil Lithography and sacrificial etching. (08 Marks)
c. What are the future challenges involved in NEMS and mention the some applications of NEMS. (04 Marks)

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Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.