



MUTHAYAMMAL ENGINEERING COLLEGE

(An Autonomous Institution)

(Approved by AICTE, New Delhi, Accredited by NAAC & Affiliated to Anna University)
Rasipuram - 637 408, Namakkal Dist., Tamil Nadu.

Department of Electronics and Communication Engineering Question Bank - Academic Year (2021-22)

Course Code & Course Name : 19ECC16 & NEMS and MEMS Technology

Year/Sem/Sec : III/VI A,B & C

Unit-I: Introduction to MEMS and NEMS

Part-A (2 Marks)

1. Define MEMS.
2. What is Microdevice?
3. List the basics of the microdevice operation.
4. Define Microstructure.
5. What do you mean by design of system?
6. List the Sequential activities.
7. Define Quantum dots.
8. Classify the electromechanical systems.
9. Recall the micro- and nanoscale sensors used in aircraft.
10. List the software tools used to design MEMS.
11. Outline the issues which must be addressed in view of evolving nature of the MEMS and NEMS.
12. Define Biomimetic systems.

Part-B (16 Marks)

1. Explain the design flow in synthesis of MEMS and NEMS. Outline the problems that must be resolved in the design of high-performance MEMS and NEMS (16)
2. Explain the classification of electromechanical system and anyone applications of MEMS. (16)
3. (i) Compare microelectronics with microsystems. (8)
(ii) Explain anyone applications of MEMS and microsystems. (8)
4. (i) Summarize the three principal silicon compounds using in MEMS system. (8)
(ii) Explain the important properties of polymers as industrial material and discuss polymers as a substrate material for MEMS. (8)
5. Describe the role of semiconductor materials and polymers in the design of MEMS. (16)
6. Explain the Flip-chip monolithic MEMS and High-level functional block diagram of the large-scale MEMS. (16)

Unit-II : MEMS Fabrication Technologies

Part-A (2 Marks)

1. Differentiate isotropic and anisotropic etchants.
2. Enlist any two of anisotropic etchants.
3. Outline surface micromachining.
4. What are the key challenges in fabrication of microstructures using surface micromachining?
5. State the capability of LIGA process
6. What do you mean by LIGA?
7. How metal evaporation is done?
8. Define photolithography.
9. Why Ion implantation is carried out?
10. Enlist the two types of etching techniques.

Part-B (16 Marks)

1. Describe the major commonly used process categories. (16)
2. Explain photolithography and thin film deposition with neat diagrams. (16)
3. Explain plasma etching and wet etching process with neat diagram. (16)
4. Explain the microelectronics fabrication process with neat diagrams.. (16)
5. Explain the process for a micro machined pressure sensor. (16)
6. Explain the concept of Surface micromachining with illustrations (16)
7. Explain the LIGA fabrication technology and its advantages over other technology. (16)

Unit-III : MICRO SENSORS

Part-A (2 Marks)

1. Why MEMS are used as sensors?
2. Where is MEMS sensor used?
3. List the different types of acoustic sensors?
4. How does an acoustic sensor work?
5. What is meant by gyroscope?
6. How does a vibrating gyroscope work?
7. Define capacitance pressure Sensor
8. What do capacitive sensors detect?
9. How do piezoelectric energy harvesters work?
10. What is meant by piezoelectric energy harvesting?

Part-B (16 Marks)

1. Explain the MEMS Sensors (16)
2. Explain the concepts of Acoustic wave sensors and its design. (16)
3. Explain about the Vibratory gyroscope (16)
4. Explain the Capacitive Pressure sensors and its types. (16)
5. Explain the Piezoelectric energy harvester (16)

Unit-IV : MICRO ACTUATORS

Part-A (2 Marks)

1. What is a thermostatic actuator?
2. What are actuators used for?
3. What is shape memory alloys actuators?
4. What is an example of a shape memory alloy?
5. What crystals are used for piezoelectricity?
6. Applications of Piezoelectric Crystal.
7. What is example of electrostatic actuation?
8. What is example of electrostatic actuation?
9. Define RF actuator?
10. What is a reflective RF switch?

Part-B (16 Marks)

1. Analysis and design of Actuators (16)
2. Explain the actuation using thermal forces (16)
3. Explain the actuation using shape memory Alloys (16)
4. Explain the actuation using piezoelectric crystals (16)
5. Explain the actuation using Electrostatic forces (16)
6. Explain the RF Switch and its applications (16)

Unit-V : NANO DEVICES

Part-A (2 Marks)

1. What are atomic structures?
2. How many types of atomic structure are there?
3. What are the basic principles of quantum mechanics?
4. What is the quantum scale?
5. What is Schrodinger equation?
6. List the importance of Schrodinger equation?

7. What is the useful application of ZnO nanorods in NEMS?
8. What are the applications of zinc oxide?
9. How do sensors detect gas?
10. List the different types of gas sensor?

Part-B (16 Marks)

1. Explain the Atomic Structures and its uses (16)
2. Explain the Quantum Mechanics and its principles (16)
3. Derive the Shrodinger Equation (16)
4. Explain the ZnOnanorods based NEMS device and its types (16)
5. Explain the operation of Gas sensor and its types (16)

Course Faculty

HoD