



B.E DEGREE EXAMINATIONS: MAY 2017

(Regulation 2014)

Sixth Semester

ELECTRONICS AND INSTRUMENTATION ENGINEERING

U14EITE 01: MEMS and Nano Technology

COURSE OUTCOMES

- CO1:** Understand the operation of micro devices, micro systems and their applications.
CO2: Understand the design of micro devices, micro systems using the MEMS fabrication process.
CO3: Outline the basics of nanotechnology.
CO4: Describe the micro machining process for MEMS systems.
CO5: Understand the design and modeling of MEMS systems using CAD tools

Time: Three Hours

Maximum Marks: 100

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1.

List I	List II
A. MEMS	i. Substrate
B. Miniaturization	ii. IC chips
C. Silicon	iii. Size and behavior of the object
D. Microelectronics	iv. Sense ,act ,think and communicate

CO1 [K₁]
- | | A | B | C | D |
|----|----|-----|----|-----|
| a) | iv | iii | i | ii |
| b) | iv | iii | ii | i |
| c) | ii | iii | iv | i |
| d) | ii | i | iv | iii |
2. MEMS Pressure sensors are developed using: CO1 [K₁]
- | | |
|---------------------|--------------------|
| a) Bourdon tubes | b) Strain gauges |
| c) Micro manometers | d) Piezo resistors |

- | | | |
|-----------------------------------|-----------------|-------------------|
| 10. Nano patterning is termed as: | CO5 | [K ₁] |
| a) Nano lithography | b) Nano mask | |
| c) Nano wafer | d) Nano imprint | |

PART B (10 x 2 = 20 Marks)

(Answer not more than 40 words)

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|--|-----|-------------------|
| 11. Mention any two MEMS devices. | CO1 | [K ₁] |
| 12. Differentiate between Microelectronics and Microsystems. | CO1 | [K ₂] |
| 13. Why is Silicon preferred as a substrate material for MEMS over the other semi conductor materials? | CO2 | [K ₂] |
| 14. Define Selectivity Ratio. | CO2 | [K ₁] |
| 15. Compare the Stiction effect in bulk and Surface micromachining methods. | CO3 | [K ₁] |
| 16. What are the parameters to be considered in choosing the polymer in LIGA process? | CO3 | [K ₁] |
| 17. Name any 4 different micro machined pressure sensors and their application in an automobile. | CO3 | [K ₂] |
| 18. What is the improvement provided by SLIGA over LIGA? | CO4 | [K ₂] |
| 19. Define Geometric aspect ratio in MEMS structures. | CO4 | [K ₁] |
| 20. List any four application of Conductive polymer. | CO5 | [K ₂] |

Answer any FIVE Questions:-

PART C (5 x 14 = 70 Marks)

(Answer not more than 300 words)

Q.No. 21 is Compulsory

- | | | |
|--|-----|-------------------|
| 21. Discuss on the different polymers used in MEMS fabrication, fabrication process, functional properties and applications. | CO1 | [K ₂] |
| 22. Elaborate on the methods of Wet etching, Edge stop and Dry etching. | CO2 | [K ₂] |
| 23. (i) Write a brief note on Plasma etching of thin films in Surface Micromachining. (7) | CO2 | [K _L] |
| (ii) Compare SM and BM in terms of both characteristics and performance taking an example. (7) | | |
| 24. Discuss in detail the LIGA process, substrate materials and Electroplating. | CO3 | [K ₂] |

25. Write your experience of the designing a Piezo resistive pressure sensor using IntelliSuite CAD software. CO3 [K₁]
26. (i) Elaborate the different types of Carbon Nano Tubes (CNT). (7) CO4 [K₂]
(ii) Discuss the next generation Molecular Nano Technology (MNT) applications. (7)
27. Compare and contrast MEMS and Nanotechnology and justify that Nanotechnology is not the natural outgrowth of MEMS. CO5 [K₂]
