



B.E DEGREE EXAMINATIONS: APRIL /MAY 2024

(Regulation 2018)

Fourth Semester

ELECTRONICS AND INSTRUMENTATION ENGINEERING

U18EIT4004: MEMS and Sensor Design

COURSE OUTCOMES

- CO1: Comprehend the Fundamentals of the fabrication techniques behind the successful MEMS devices.
- CO2: Appreciate the importance of micro fabrication.
- CO3: Comprehend the principles of nano fabrication techniques and typical clean room.
- CO4: Apply the principal mechanisms of thin film deposition, lithography, arching and other techniques.

Time: Three Hours

Maximum Marks: 100

Answer all the Questions:-

PART A (10 x 2 = 20 Marks)

(Answer not more than 40 words)

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|---|-----------------------|
| 1. What is meant by micro fabrication? | CO1 [K ₁] |
| 2. Write short notes on wafer growth process. | CO2 [K ₂] |
| 3. Recall on e-beam Lithography. | CO3 [K ₁] |
| 4. What are the types of dry etching used in microfabrication? | CO4 [K ₁] |
| 5. Mention the advantages of using Atomic layer deposition. | CO1 [K ₂] |
| 6. Recall the usage of positive and negative photoresist. | CO2 [K ₂] |
| 7. What are the drawbacks of chemical vapor deposition? | CO3 [K ₁] |
| 8. Mention the reactants used in metal organic CVD process. | CO4 [K ₁] |
| 9. Recall the material properties chosen for TEM analysis of piezo resistive pressure sensor. | CO3 [K ₂] |
| 10. List few materials used in fabrication of MEMS sensors. | CO4 [K ₁] |

Answer any FIVE Questions:-
PART B (5 x 16 = 80 Marks)
(Answer not more than 400 words)

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|-----|----|--|----|-----|-------------------|
| 11. | a) | Discuss the principle of MEMS inertia sensor which is used in airbag systems of automobiles with a neat diagram. | 8 | CO1 | [K ₂] |
| | b) | Summarize the process of diffusion and ion implantation with neat diagrams. | 8 | CO1 | [K ₂] |
| 12. | a) | Discuss the process of depositing Gallium Arsenide upon a Si substrate through metal organic CVD process | 8 | CO2 | [K ₂] |
| | b) | Explain the sputtering process of depositing materials with necessary diagrams. | 8 | CO2 | [K ₂] |
| 13. | a) | Explain surface micromachining process with an example. | 12 | CO3 | [K ₃] |
| | b) | What are the drawbacks of wet etching process? | 4 | CO3 | [K ₃] |
| 14. | a) | Summarize the process of lithography with neat diagrams. | 8 | CO4 | [K ₃] |
| | b) | Explain in detail about the thermal evaporation process used in micro fabrication. | 8 | CO4 | [K ₃] |
| 15. | | Discuss the steps involved in Sensor Design and modeling of Piezo resistive pressure sensor using CAD tool. | 16 | CO1 | [K ₃] |
| 16. | | Illustrate the steps involved in designing the capacitive accelerometer and explain the electrical analysis with necessary diagrams. | 16 | CO1 | [K ₃] |
