Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 10859

M.E./M.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2023

Elective

Manufacturing Engineering

MF 4009 – MEMS AND NANOTECHNOLOGY

(Regulations 2021)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the components of a typical microelectonic system?
2. What are the application of piezo-resistors?
3. List out the major steps involved in LIGA process.
4. Differentiate device level and system level micro system packaging.
5. How sensors can be classified?
6. List out the benefits of chemical and bio sensors.
7. What are the effect of nano scale dimensions on vibration.
8. Write a brief note on high energy ball milling process.
9. What is scanning tunnelling microscopy?
10. Write a brief note on application of Raman spectroscopy for the characterization of nanostructures?

PART B — (5 × 13 = 65 marks)

11. (a) Explain the various mechanical properties of the following materials.
    (i) Silicon piezo resistors (5)
    (ii) Gallium arsenide (4)
    (iii) Quartz. (4)

Or

(b) Describe in detail the working principle, applications, and advantages of microsystems.

12. (a) Explain with neat sketch of surface micro machining process and compare with bulk micro machining.

Or

(b) Describe in detail the different packing technologies used for assembly of microsystems.

13. (a) Explain with neat sketch of micro actuators working principle advantages and applications.

Or

(b) Write a detail note on.

(i) Pressure sensor (5)

(ii) Flow sensor (4)

(iii) Accelerometer. (4)

14. (a) Discuss the effect of nano scale dimensions on structural, thermal and optical properties of materials.

Or

(b) Explain sol-gel synthesis and inert gas condensation procedure for synthesis of nanomaterials.

15. (a) Explain in detail the principle, working and application of TEM for the characterization of different properties of nanomaterials.

Or

(b) Discuss the application of diffraction methods and 3D surface analysis for the evaluation of properties of nanomaterials and nanostructures.

PART C — (1 × 15 = 15 marks)

16. (a) Explain with neat sketch of electron beam and ion beam processes and advantages, limitations and its applications.

Or

(b) Discuss in detail the synthesis of carbon nano tubes, properties, advantages, limitations and applications.

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