KUMARAGURU
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Register Number:…………

B.E DEGREE EXAMINATIONS: APRIL/MAY 2016

(Regulation 2013)

Sixth Semester

ELECTRONICS AND INSTRUMENTATION ENGINEERING

U13EITE01: MEMS and Nano Technology

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. MEMS tunable resonator finds its application in
   a) Consumer Products b) Manufacturing Industry
   c) Aerospace Industry d) Telecommunications
2. Aspect ratio is defined as the ratio of the dimensions in _____________ to that of ____________.
3. The most favoured orientation for Silicon is
   a) <100> b) <101>
   c) <110> d) <111>
4. PSG stands for ________________.
5. Square diaphragm is ________ popular geometry in micro pressure sensors.
   a) The Most b) The Least
   c) somewhat d) Never
6. The damping effect of the compressible fluids will _________ with increase of the input frequency of the vibrating mass.
7. Photolithography means _______________ of the Microsystem.
   a) Making a photograph b) Creating a pattern of the geometry
   c) Producing the label d) Making a 3D model
8. The cheapest thermal and electrical insulation material in MEMS is _____________.
9. Nano patterning is termed as
   a) Nano lithography b) Nano imprint
   c) Nano mask d) Nano wafer
10. The very first human made Nanostructure is _____________________.

PART B (10 x 2 = 20 Marks)

(Answer not more than 40 words)

11. Analyse the reason for the least preference of Electromagnetic actuation against Electrostatic actuation in MEMS.
12. "Quartz is more stable than silicon and hence preferred in making MEMS sensors" – True or False. Justify
13. Write the need for an Electrically conducting base plate in LIGA process.
14. Compare the Stiction effect in bulk and Surface micromachining methods.
15. Assess the effect of damping on the amplitude of a cantilever beam-mass system.
16. Discuss the interesting feature of Shape Memory Alloy.
17. Enlist the advantages of CAD software in MEMS applications.
18. List the three major databases available in IntelliSuite CAD package.
19. What are Nanowires?
20. Briefly describe the possible Nanosensors.

PART C (5 x 14 = 70 Marks)

(Answer not more than 400 words)

Q.No. 21 is Compulsory

21. (i) Compare Microsystems and Microelectronics in ten different ways. (10)

(ii) Discuss in brief the role of Polymers in MEMS. (4)

22. (a) (i) Define Selectivity Ratio. (2)

(ii) Elaborate on the methods of Wet etching, Edge stop and Dry etching. (12)

(OR)

(b) (i) Discuss in detail the LIGA process, substrate materials and Electroplating. (12)

(ii) Differentiate LIGA and SLIGA. (2)

23. (a) (i) Choose a circular plate of radius 'a' and thickness 'h' for building a MEMS pressure sensor and derive its maximum deflection and the stress factors. (7)

(ii) A square Silicon diaphragm with 400µm egde length is subjected to the pressure loading of 25MPa. The diaphragm thickness is 10 µm. Assume the other values as typical and calculate the maximum stress and deflection. (7)

(OR)

(b) Design a typical MEMS accelerometer and draw its schematic configurations.

24. (a) Enumerate the twelve steps needed in the design and analysis of a cantilever beam using IntelliSuite CAD software.

(OR)

(b) Write your experience of the designing a piezoresistive pressure sensor using IntelliSuite CAD software.

25. (a) Compare and contrast MEMS and Nanotechnology and justify that Nanotechnology is not the natural outgrowth of MEMS. (10)

List the challenges in Nanotechnology. (4)

(OR)

(b) Elaborate the different types of Carbon Nano Tubes(CNT). (7)

Discuss the next generation Molecular nano Technology(MNT) applications. (7)

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