

Elective - I : Micro Electromechanical Systems & System on Chip

P. Pages : 2

Time : Three Hours



KNT/KW/16/7456

Max. Marks : 80

- Notes :
1. All questions carry marks as indicated.
 2. Solve Question 1 OR Questions No. 2.
 3. Solve Question 3 OR Questions No. 4.
 4. Solve Question 5 OR Questions No. 6.
 5. Solve Question 7 OR Questions No. 8.
 6. Solve Question 9 OR Questions No. 10.
 7. Solve Question 11 OR Questions No. 12.
 8. Assume suitable data whenever necessary.
 9. Illustrate your answers whenever necessary with the help of neat sketches.

1. a) Explain Miniaturization and explain its benefits. 7
b) Write short note on Bio – MEMS. 6

OR

2. a) Explain the difference between MEMS and Microsystems. What are the principle applications of Micro Sensors? 7
b) Explain Accelerometer in MEMS with its application. 6
3. a) Draw and explain Bulk micromachining process. 7
b) Explain LIGA process used in micromachining techniques. 7

OR

4. A silicon substrate is doped with boron ions at 100 k.eV. Assume the maximum concentration after the doping is $30 \times 10^{18} / \text{cm}^3$. Find a) the dose Q, b) the dopant concentration at a dept. of $0.15 \mu\text{m}$ and, c) the depth at which the dopant concentration is 0.1 percent of the maximum value. 14
given data :
The projected range for boron ion is 307 nm at 100 k.eV or $R_p = 307 \text{nm}$ and the straggle, $\Delta R_p = 69 \text{nm}$.
5. a) What is sensor. Explain chemical sensor and Biosensor. 7
b) Differentiate between chemical and biological transducer. 6

OR

6. a) Determine the capacitance of a parallel plate capacitor. The two plates have identical dimensions of $L = W = 100\mu\text{m}$ with a gap $d = 2\mu\text{m}$. Air is the dielectric medium between the two plates (permittivity of air, $\epsilon = 1$ (one)). **7**

b) Explain the working principle of thermal transducer and magnetic transducer. **6**

7. Write short notes on following.
RF MEMS Devices.

i) Capacitor **4**

ii) Inductor **5**

iii) Antenna **5**

OR

8. a) List the applications of RF MEMS devices. **7**

b) What are the characteristic features of the methods that can be used in RF MEMS devices? **7**

9. a) Explain the role of MEMS packages and various parameters associated with it. **7**

b) Explain the Flip – chip assembly in MEMS. **6**

OR

10. a) What are the different types of packaging material used in MEMS packaging technology. Explain in brief. **7**

b) Explain the process of microsystem packaging by taking example of a case study of pressure sensor. **6**

11. a) Explain the system on Chip and its design process. **7**

b) Explain microsystem technology & give its applications. **6**

OR

12. a) What are the design considerations for a microsystem design? Explain in brief. **7**

b) What are the different methods of signal transduction in the microsystems design? What is the criteria for selection of these methods? **6**
