Roll No. | | | | | | | | | | | | Total No. of Pages : 02

Total No. of Questions : 08

M.Tech. (ECE) (Sem.–3)

MEMS AND NEMS

Subject Code : MTEC-PE5A-18

M.Code : 76584

Date of Examination : 16-12-22

Time : 3 Hrs. Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. Attempt any FIVE questions out of EIGHT questions.
2. Each question carries TWELVE marks.

1. a) With suitable diagram, differentiate between thermal evaporation and E-beam evaporation deposition method. (8)

   b) What is a sacrificial layer? Why is it used in MEMS? Give an example. (4)

2. a) If you are asked to make v-shaped grooves 60μm deep in an oxidized (100) silicon wafer then how wide must the openings in the oxide mask be in order to achieve this result? (8)

   b) Determine the Miller indices for plane shown in the figure 1. (4)

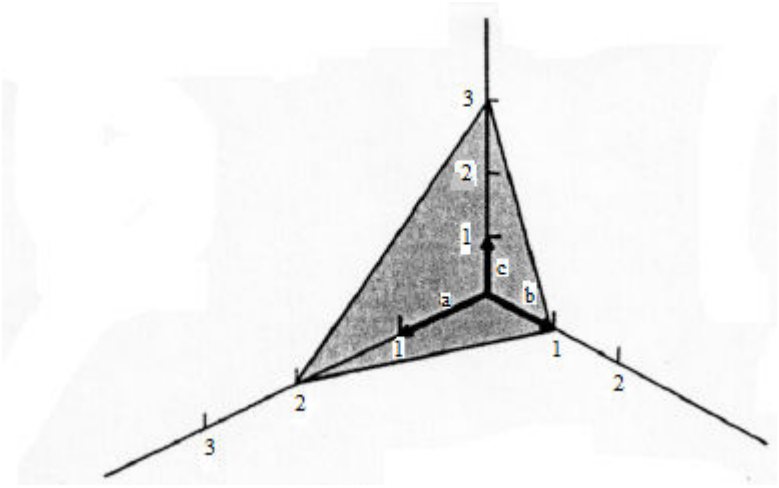

Fig. 1

3. a) Describe and draw the processing steps to achieve the following pattern (figure 2) using Lift-Off process.

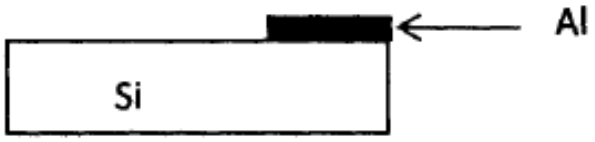

Fig. 2

b) What are the three principal Silicon compound materials used in MEMS and Microsystems? Explain briefly about each of them. (6)

4. Enlist all the basic steps in UV photolithography for pattern transfer (with the help of diagrams). (12)

5. Enlist all methods by which dopants can be introduced into silicon. Explain two of them (with diagrams) which are used for locally varying the dopant concentration. (12)

6. a) With suitable diagram, differentiate between sputtering and e-beam evaporation. (6)

b) Write a short note on following : (i) Phase shifters (ii) Filters (6)

7. a) What is Pull-In voltage? What are the two conditions that must be satisfied at Pull-in? Also, derive the expression for the same. (6)

b) Explain (with diagram) the Mechanical model of resonator for the following:

a) Single resonator, and b) mechanically coupled resonator. (6)

8. Explain micromachined resonator circuits. Draw the mechanical model of single resonator and mechanically coupled resonator and explain its working. (12)

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.