Ref. No.: Ex/MI402/B/2022

M.SC. INSTRUMENTATION SCIENCE SECOND YEAR SECOND SEMESTER EXAM- 2022

SUBJECT: **DEVICE FABRICATION TECHNOLOGY**
Time: 4 Hours Full Marks: 80

Use separate Answer Script for each Group

GROUP-A

Answer question no. one and any three from the rest

1. 10x1 = 10

A. Torr is equal to _____ Pa
B. Sticking coefficient is the ratio of _____
C. Sputter yield depends on _____
D. In MOCVD precursor is _____
E. _____technique is suitable for layer by layer thin film decomposition
F. What are the types of MOSFET devices available?
G. Basic steps of MEMS fabrications are_____
H. How long does it take to form a monolayer of gas on the surface of a substrate?
I. What is ALD?
J. Draw the diagram for deposition rate Vs Temperature for CVD.

2. A. What is the role of Thin films in devices explain briefly. 3+3+4=10
B. Explain chemical vapour deposition technique.
C. Write short notes on Sputtering.

3. A.What are the advantages and disadvantages in PLD. 3+3+4=10
B. Explain Physical vapour deposition.
C. How AFM used for thin film characterization.

4. A.What is molecular beam Epitaxy? 4+3+3=10
B. Describe Electrical Properties of Thin Film.
C. Write short notes on PECVD.

5. What is Bi-MEMs? What are the major technical issues involved in Bio-MEMs products? Write on Bio-Sensors and Bio-medical sensors. 2+3+5 = 10

6. Write short notes on the following: 5x2 = 10
(a) Micro-optical sensors (b) Micro-thermal sensors.

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GROUP-B

Use separate Answer Script for each group
Answer any four questions

1. What is full form of MEMS? What are the applications of MEMS technology? Describe chemical or wet etching method with possible chemical reaction. What are the differences between anisotropic and isotropic wet etching? 1+2+4+3
2. How one can differentiate the types of Si wafers by observing them physically? What are the advantages of Si as a substrate in MEMS? Describe the plasma etching process briefly. 3+2+5
3. What is Wafer Bonding? What are the different types of wafer bonding? Describe any two types of wafer bonding process and mentioned the various materials required for different process and their usefulness. 1+3+6
4. What is photo lithography? What are the essential components required for it? What are the essential properties of a good photo-resist? Compare different types of photo resist. Describe the basic steps (with suitable figure) for photo-lithography. 2+2+2+2+2
5. What is e-beam lithography? Briefly describe the e-beam lithography process. Compare between photo-lithography and e-beam lithography. 2+5+3
6. Draw and level different parts of a pressure sensor. Describe how one can fabricate pressure sensor by using MEMS technology. 3+7