2404N329

Candidate's Seat No :_____

M.Sc. Semester-4 Examination

507

Electronics Science

Time : 2-30 Hours] **April-2023** **[Max. Marks : 70**

Instructions:

1. Attempt all questions.
2. Assume data when necessary
3. Symbols used have their usual meanings.

Q-1 (A)	Explain the steps required for the silicon wafer shaping. Give details of the procedure of silicon wafer polishing. State its limitations.	7
(B)	What do you mean by metallurgical grade silicon ? Using necessary diagram, explain the preparation of electronic grade silicon.	7
	OR	
Q-1 (A)	Differentiate between Czochralski and float Zone methods of Silicon crystal growth. Discuss the Float Zone method (CZ) of Si-crystal growth.	7
(B)	Explain (i) segregation coefficient and effective segregation coefficient. (ii) Carbon and oxygen in grown silicon crystal	7
Q-2 (A)	Explain in detail, "**wet etching** technique". And also discuss, (1) silicon etching, (2) silicon oxidation etching.	7
(B)	Explain in detail, "**Electron-beam** lithography".	7
	OR	
Q-2 (A)	Explain in detail, "**pattern transfer** in lithography".	7
(B)	Discuss in detail, "**Photoresist materials** of lithography". Explain the exposure-response curve of photoresist.	7
Q-3 (A)	Briefly explain vacancy model of diffusion. Explain the Fick's theory of diffusivity for constant surface concentration.	7
(B)	Explain the process of electromigration. How it can be reduced in metallization processes with aluminum?	7
	OR	
Q-3 (A)	Discuss different VLSI package types and their design considerations. Describe the die bonding process used in VLSI interconnects.	7
(B)	Distinguish between diffusion and ion implantation. Explain (i) ion stopping mechanism and (ii) channeling process in a typical ion implantation	7
Q-4 (A)	Explain the fabrication process of **NMOS** VLSI-IC Technology step-by-step. Explain the special case -(1) Isolation, (2) channel doping.	7
(B)	Discuss in detail, 'Fabrication process of **GaAs** VLSI-IC Technology'	7
	OR	
Q-4 (A)	Explain the fabrication process of **CMOS** VLSI-IC Technology step-by-step. Explain the special case -(1) Isolation, (2) latch-up.	7
(B)	Discuss in detail, "**Electrostatic Discharge Damage** (EDD)". And write all the protection circuit mechanism.	7

Q-5 Attempt any **SEVEN** questions from the following. Each carries TWO marks. **14**

1 Which type of wafer has only primary flat –
(a) {100} p-type
(b) {111} p-type
(c) {100} n-type
(d) {111} n-type

2 In grown silicon crystal, the common impurities are carbon and oxygen, which most commonly occupy
(a) interstitial sites only
(b) substitutional sites only
(c) substitutional and interstitial sites respectively
(d) interstitial and substitutional sites respectively

3 For heavy doping of silicon wafer, which method is suitable ?
(a) Melt growth
(b) Diffusion
(c) Ion implantation
(d) Mechanical-chemical

4 If the segregation coefficient $k_o < 1$, then
(a) Melt will be richer in impurity
(b) Crystal will be richer in impurity
(c) Point defects will be created in grown crystal
(d) Dislocations will be created in grown crystal

5 Junction spiking is related to
(a) Metallization
(b) Ion impantation
(c) Diffusion
(d) Packaging

6 The term *epoxy die bonding* is associated with ____
(a) Metallization
(b) Ion implantation
(c) Lithography
(d) Packaging

7 Explain how ion-beam lithography is better than electron-beam lithography?

8 P-glass deposition at lower temperatures becomes soft and flows upon heating. it provides smoother surface topology and isolation, but why we can't increase phosphorus content/concentration >8 wt% (weight percentage) in order to decrease flow angle?

9 For a planner structure, area A is reduced with increasing DRAM density. Therefore, one of constant of the film must be increased. What is the name of that constant?
(a) The capacitance constant
(b) The diffusion constant
(c) The conductivity constant
(d) The dielectric constant

10 What is the importance of **LDD** and **DDD**?

11 Write how water can purify in the large quantity from variety of contaminations in the purification plant?

12 What is called, "**soft error**", and how to stop this occurrence of soft error?

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