Printed Page:-3 **Subject Code:- BEC0515**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: V - THEORY EXAMINATION (2025 - 2026)

Subject: VLSI Technology

Time: 3 Hours **Max. Marks: 100**

General Instructions:

IMP: *Verify that you have received the question paper with the correct course, code, branch etc.*

1. *This Question paper comprises of* ***three Sections -A, B, & C.*** *It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.*

2. *Maximum marks for each question are indicated on right -hand side of each question.*

3. *Illustrate your answers with neat sketches wherever necessary.*

4. *Assume suitable data if necessary.*

5. *Preferably, write the answers in sequential order.*

6. *No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.*

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SECTION-A 20

1. Attempt all parts:-

1-a. SIMS full form: (CO1, K1) 1

(a) Secondary ion mass spectrometry
(b) Single ion mapping system
(c) Silicon mass scan
(d) Sequential ion monitor

1-b. Which feature best defines a Class-100 cleanroom? (CO1, K2) 1

(a) ≤1 particle/ft³
(b) ≤10 particles/ft³
(c) ≤1000 particles/ft³
(d) ≤100 particles/ft³

1-c. Wet oxidation offers: (CO2, K1) 1

(a) Faster growth
(b) Slower growth
(c) No growth
(d) Etching only

1-d. Deal-Grove model describes: (CO2, K1) 1

(a) Diffusion profiles
(b) Oxidation kinetics
(c) Implant depth
(d) Etch rate

1-e. What is the primary purpose of lithography in IC fabrication? (CO3, K1) 1

(a) To grow oxide
(b) To transfer patterns
(c) To deposit metals
(d) To package devices

1-f. Which gas is commonly used for polysilicon CVD? (CO3, K1) 1

(a) SiH_4
(b) Cl_2
(c) NH_3
(d) O_2

1-g. Ion implantation introduces atoms mainly by: (CO4, K1) 1

(a) Thermal energy
(b) Electric field acceleration
(c) Photon bombardment
(d) Pressure force

1-h. Diffusion coefficient D depends on: (CO4, K2) 1

(a) Humidity
(b) Temperature
(c) Dopant color
(d) Pressure only

1-i. Which metal is most commonly used for CMOS interconnects due to low resistivity? (CO5, K1) 1

(a) Aluminum
(b) Copper
(c) Tungsten
(d) Titanium

1-j. The main drawback of aluminum metallization is: (CO5, K1) 1

(a) High cost
(b) High resistivity
(c) Electromigration susceptibility
(d) Difficult deposition

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2. Attempt all parts:-

2.a.	List any two clean room classes. (CO1, K2)	2
2.b.	Define epitaxy and its types. (CO2, K2)	2
2.c.	Define Optical Lithography. (CO3, K1)	2
2.d.	State the significance of Models of diffusion in solids. (CO4, K2)	2
2.e.	List the key features of Metallization Choices. (CO5, K2)	2

SECTION-B 30

3. Attempt all parts:-

3.a. Answer any one of the following:-

3.a.(i) Differentiate between wet and dry etching. (CO1, K2) 6

3.a.(ii)	Describe constant vs limited source diffusion profiles. (CO1, K2)	6
3.b. Answer any one of the following:-		
3.b.(i)	Explain vapor-phase epitaxy with diagram. (CO2, K2)	6
3.b.(ii)	Discuss SOI technology with suitable diagram. (CO2, K2)	6
3.c. Answer any one of the following:-		
3.c.(i)	Compare optical lithography and electron beam lithography. (CO3, K2)	6
3.c.(ii)	Explain positive and negative photoresists with applications. (CO3, K2)	6
3.d. Answer any one of the following:-		
3.d.(i)	Describe Fick's 1-Dimensional diffusion equation with suitable examples. (CO4, K2)	6
3.d.(ii)	Explain major process parameters that influence Fick's 1-Dimensional diffusion equation. (CO4, K2)	6
3.e. Answer any one of the following:-		
3.e.(i)	Compare Metallization Choices with other related techniques. (CO5, K2)	6
3.e.(ii)	Explain the working principle of Failure Mechanisms in Metal Interconnects. (CO5, K2)	6
SECTION-C		50
4. Answer any one of the following:-		
4-a.	Explain wafer cleaning processes and chemicals used also write its chemical reaction. (CO1, K2)	10
4-b.	Explain anisotropic and isotropic etching with diagrams. (CO1, K2)	10
5. Answer any one of the following:-		
5-a.	Explain Bragg's law in epitaxial evaluation. (CO2, K2)	10
5-b.	Explain oxidation growth kinetics and its limitations. (CO2, K2)	10
6. Answer any one of the following:-		
6-a.	Discuss the importance of photolithography in IC fabrication with suitable diagram. (CO3, K2)	10
6-b.	Explain CVD techniques for deposition of polysilicon in detail. (CO3, K2)	10
7. Answer any one of the following:-		
7-a.	Explain Diffusion Profiles with neat diagrams and detailed steps. (CO4, K2)	10
7-b.	Explain theoretical models, mathematical derivations, and practical issues involved in Solid, Liquid and Gaseous Sources. (CO4, K2)	10
8. Answer any one of the following:-		
8-a.	Explain Failure Mechanisms in Metal Interconnects with neat diagrams and detailed steps. (CO5, K2)	10
8-b.	Explain CMOS Fabrication Steps with suitable diagrams for each step. (CO5, K2)	10

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