Reg. No | | | | | | | | | | | AY 23

GIET UNIVERSITY, GUNUPUR – 765022

M. Tech (First Semester) Examinations, January – 2024

MPCVL1010– Semiconductor Devices

(VLSI Design)

Time: 3 hrs Maximum: 70 Marks

(The figures in the right hand margin indicate marks.)

PART – A **(2 x 10 = 20 Marks)**

Q.1.	Answer all questions	CO#	Blooms Level
a.	What is the working principle of MOS capacitor?	CO1	K1
b.	What is schottky barrier mechanism?	CO1	K2
c.	What is PN junction and its characteristics?	CO1	K2
d.	What is the snapback breakdown mechanism?	CO2	K1
e.	What is the difference between a primitive cell and unit cell?	CO3	K2
f.	What is the meaning of hetero junction?	CO2	K1
g.	What is the difference between forward and reverse bias?	CO1	K3
h.	What is the difference between a lattice and crystal?	CO4	K1
i.	What is the principle of AC DC conversion?	CO3	K3
j.	What is the difference between zero-dimensional, one-dimensional, two-dimensional, and three-dimensional defects in a semiconductor?	CO4	K1

PART – B **(10 x 5=50 Marks)**

Answer ***ANY FIVE*** questions

		Marks	CO#	Blooms Level
2. a.	Compare and contrast the characteristics of P-type and N-type semiconductor junctions. Provide insights into their respective behaviours and applications.	5	**CO1**	K2
b.	Illustrate the detailed structure of a HEMT (High Electron Mobility Transistor) and discuss its key features that make it suitable for specific electronic applications.	5	**CO1**	K3
3.a.	Elaborate on the distinctions between forward bias and reverse bias in semiconductor devices. Explain the effects of these biases on device behaviour.	5	**CO2**	K2
b.	Provide a comprehensive explanation of the primitive cell in crystallography, outlining its significance in understanding the structure of crystalline materials.	5	**CO2**	K4
4. a.	Explore the different types of metal-semiconductor junctions, and classify them based on their characteristics. Highlight their applications in electronic devices.	5	**CO3**	K2

b.	Examine the fundamental differences between a lattice and a crystal, emphasizing their roles in the context of material science and semiconductor physics.	5	**CO3**	K2
5.a.	Define and expound upon the concept of base narrowing in semiconductor devices. Discuss its implications for device performance and functionality.	5	**CO4**	K1
b.	Investigate the snapback breakdown mechanism in semiconductor devices, detailing the conditions under which it occurs and its impact on device reliability.	5	**CO4**	K2
6. a.	Analyze the characteristics of ohmic contact IV (current-voltage) in semiconductor devices, elucidating their significance in the context of device functionality.	5	**CO2**	K3
b.	Craft a detailed note on the Gummel-Poon model, exploring its principles, applications, and relevance in semiconductor device modelling.	5	**CO3**	K2
7.a.	Compare and contrast the Ebers-Moll model with the Gummel-Poon model, highlighting their respective advantages and limitations in semiconductor device analysis.	5	**CO2**	K4
b.	Delve into the working principle of a MOS (Metal-Oxide-Semiconductor) capacitor, explaining how it functions and its role in semiconductor devices.	5	**CO2**	K2
8. a.	Provide a thorough explanation of the PN Junction diode, covering its IV characteristics and discussing the applications and significance of these characteristics.	5	**CO1**	K3
b.	Explore the Schottky barrier mechanism in semiconductor devices, and elucidate its applications and importance in electronic components.	5	**CO2**	K2

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