Reg.No.:												

VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]
Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 7031

M.E. / M.Tech. DEGREE END-SEMESTER EXAMINATIONS – JUNE / JULY 2024
Second Semester
VLSI Design
P23VDE12 – NANO ELECTRONICS
(Regulation 2023)

Time: Three Hours | Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	Interpret situation where wet etching is preferred over dry etching, and vice versa.	2	K2	CO1
2.	Recall the purpose of the feedback loop in Scanning Probe Microscopy.	2	K2	CO1
3.	Infer the significance of the "rolling vector" in carbon nanotube (CNT) chirality.	2	K2	CO2
4.	Relate the structural difference between zigzag and armchair CNTs.	2	K2	CO2
5.	How does channel length modulation affect the performance of a MOSFET?	2	K1	CO3
6.	Name one potential application of superconductor digital electronics in quantum computing.	2	K1	CO3
7.	Recall the choice of high permittivity material that can affect the retention time of stored data in DRAM cells.	2	K2	CO4
8.	What is holographic data storage?	2	K1	CO4
9.	Infer the role of liquid crystals in determining the response time of an LCD.	2	K2	CO5
10.	What is the typical frequency range employed by microwave communication systems in the context of 5G and upcoming 6G technologies?	2	K1	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.			Questions	Marks	KL	CO
11.	a)		Explain the steps involved in photolithography and explain how it is used in semiconductor fabrication.	13	K2	CO1
			(OR)			
	b)		Provide a comprehensive overview of wet and dry etching techniques used in IC fabrication. Explain the fundamental principles, process parameters, selectivity, and etch profiles associated with each technique.	13	K2	CO1
12.	a)	i.	Outline the structural characteristics of carbon clusters and CNTs.	6	K2	CO2
		ii.	Explain the concept of chirality in CNTs and their significance in determining the electrical and mechanical properties of CNTs.	7		
			(OR)			
	b)		Compare and contrast the CVD and arc discharge methods for synthesizing CNTs. Discuss the process parameters, including temperature, pressure, catalysts, and carbon sources, involved in each fabrication method.	13	K2	CO2
13.	a)	i.	Define Ferroelectric Field-Effect Transistors (FeFETs) and explain how they differ from conventional MOSFETs in terms of their operation and structure.	7	K2	CO3
		ii.	Outline the advantages of FeFETs in non-volatile memory applications and their potential impact on future computing architectures.	6		
			(OR)			
	b)	i.	Explain the basic principles of superconductivity and how they can be exploited in digital electronics.	7	K2	CO3
		ii.	List the challenges and opportunities associated with integrating superconducting devices into digital circuits.	6		
14.	a)	i.	Explain the underlying mechanism of magneto-resistive RAM and its dependence on magnetic field manipulation.	7	K2	CO4
		ii.	Relate the potential applications and advantages of magneto-resistive RAM in modern computing systems.	6		
			(OR)			

	b)	i.	Illustrate the mechanism of data recording and erasing in rewriteable DVDs based on phase change materials.	7	K2	CO4
		ii.	Compare the read/write characteristics of phase change-based DVDs with other optical storage formats	6		
15.	a)	i.	Outline the key components of microwave communication systems with the help of a block diagram.	7	K2	CO5
		ii.	Explain the principles of microwave transmission, including line-of-sight propagation, Fresnel zones, and signal attenuation.	6		
			(OR)			
	b)	i.	Explain the working principle and fabrication process of OLEDs with the help of a neat sketch.	8	K2	CO5
		ii.	Outline the advantages of OLED technology over traditional LEDs and LCDs.	5		

PART – C

(1 x 15 = 15 Marks)

Q.No.		Questions	Marks	KL	CO
16.	a)	Compare and contrast chemical vapor deposition and physical vapor deposition techniques in terms of their deposition mechanisms, process parameters, film properties, and applications in semiconductor manufacturing. Provide examples of specific materials and devices where each deposition method finds significant use.	15	K4	CO1
		(OR)			
	b)	Describe the architecture and components of a photonic network. Discuss the advantages of photonic networks over traditional electronic networks. Explain the challenges associated with the deployment of photonic networks in large-scale communication infrastructures and potential strategies to address these challenges.	15	K2	CO5