22/5/25

FN

Roll No. | | | | | | | | | | |

ADDITIONAL CONTROLLER OF EXAMINATIONS AU CHENNAI 600 025

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.Tech (Full Time) - END SEMESTER EXAMINATIONS, May & 2025

Information Technology

II Semester

PH23C08 FUNDAMENTALS OF ELECTRONIC MATERIALS AND DEVICES

(Regulation 2023)

Time: 180 minutes | Answer ALL Questions | Max.Marks : 100

CO 1	To understand and apply the electrical properties of materials
CO 2	To explore the principles of semiconductor and display devices
CO 3	To make use of magnetic and optical data storage devices
CO 4	To implement the essential principles of digital electronics for communication
CO 5	Understand the basics of quantum structures and their applications and basics of quantum computing

BL – Bloom's Taxonomy Levels

(L1 - Remembering, L2 - Understanding, L3 - Applying, L4 - Analysing, L5 - Evaluating, L6 - Creating)

PART- A (10 x 2 = 20 Marks)

Q. No	Questions	Marks	CO	BL
1	How does band theory differ from free electron theory?	2	1	L2
2	What is meant by direct band gap semiconductors?	2	1	L2
3	How an Ohmic contact is formed?	2	2	L1
4	Give the principle of quantum well laser.	2	2	L2
5	Define the terms magnetic permeability and susceptibility.	2	3	L1
6	Compare CD, DVD and Blu-ray Disc.	2	3	L2
7	Convert $(11011001)_2$ to decimal value.	2	4	L3
8	Construct NOR gate using NAND gates.	2	4	L3
9	Define quantum confinement.	2	5	L1
10	What is CNOT gate?	2	5	L2

PART- B (5 x 13 = 65 Marks)

Q. No	Questions	Marks	CO	BL
11 (a) (i)	What is density of states and derive an expression for the density of states in a metal.	10	1	L2
(ii)	At what temperature there is 1% probability in an energy level having energy 0.5 eV above Fermi energy?	3	1	L4
	OR			
11 (b) (i)	Discuss the dependence of Fermilevel and conductivity of extrinsic semiconductor with temperature in detail with neat sketch.	10	1	L2
(ii)	A p-type silicon and n-type silicon sample have the same dopant concentration. Which has higher conductivity? Justify your answer. Given μ_n = 1350 cm² / Vs and μ_h = 480 cm² / Vs.	3	1	L4
12 (a) (i)	What is Hall effect? Derive an expression for Hall voltage for n-type semiconductor with neat diagrams.	10	2	L3
(ii)	A semiconductor sample of width 0.5mm and thickness 1mm is placed in a magnetic field of 500 Gauss. If the probe current and Hall voltage are 5.0 mA and 6.8 mV respectively, find the Hall coefficient, carrier concentration and the type of semiconductor.	3	2	L3

	OR			
12 (b) (i)	With neat diagrams explain the working of Liquid Crystal Display.	10	2	L3
(ii)	Give the differences between LED and LCD.	3	2	L3
13 (a) (i)	What is Giant Magnetoresistance and how is it used in magnetic hard disc as GMR sensor to read the data.	10	3	L3
(ii)	Discuss the properties of soft and hard magnetic materials.	3	3	L4
	OR			
13 (b) (i)	Explain in detail the magneto-optical data storage system with neat figures.	10	3	L3
(ii)	State the differences between phase change recording and magneto optical recording	3	3	L4
14 (a)	Construct a logic circuit after simplifying the following Boolean expression $Y = (\overline{C+D}) + \overline{A}\ C\ \overline{D} + A\,\overline{B}\,C + A\,C\,\overline{D}$	13	4	L5
	OR			
14 (b)	Construct a logic circuit after minimizing the following function in SOP minimal form using K-map F (A, B, C, D) = ∑m (1, 2, 6, 7, 8, 13, 14, 15) + ∑d (3, 5, 12). Here d denotes the don't care condition.	13	4	L5
15 (a)	Describe the construction and working of single electron transistor with neat diagrams.	13	5	L3
	OR			
15 (b)	Discuss the characteristics of quantum computers and mention the advantages of quantum computing.	13	5	L3

PART- C (1 x 15 = 15 Marks)

Q. No	Questions	Marks	CO	BL
16 (i)	Obtain an expression for carrier concentration in intrinsic semiconductor.	12	5	L3
(ii)	A sample of intrinsic silicon at room temperature has a carrier concentration of 1.5 x 10^{16} /m^3. A donor impurity is added to the extent of 1 donor atom per 10^8 atoms of silicon. If the concentration of silicon atom is 5 x 10^{28} atoms /m^3, determine the free electron and hole concentration.	3	5	L5