

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2025

Second Semester

Electronics and Communication Engineering

(Common to Electrical and Electronics Engineering & Computer and Communication Engineering)

24BSPH201 - PHYSICS OF ELECTRONIC DEVICES

Regulations - 2024

Duration: 3 Hours

Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

	Marks	K- Level	CO
1. Identify the unit of Lorentz number. (a) $W\Omega K^{-2}$ (b) $W^{-2}\Omega K^{-2}$ (c) $W\Omega^{-2}K$ (d) $W^{-2}\Omega^{-2}K$	1	K1	CO1
2. Fermi distribution function is given by..... (a) $F(E) = 1/1 - e^{(E-E_F)/kT}$ (b) $F(E) = 1/1 + e^{(E-E_F)/kT}$ (c) $F(E) = 1/e^{(E-E_F)/kT}$ (d) $F(E) = 1/e^{(E-E_F)/kT} - 1$	1	K1	CO1
3. Semiconductors exhibits..... of resistance (a) positive temperature coefficient (b) zero (c) independent of temperature (d) negative temperature coefficient	1	K1	CO2
4. In a PN junction, holes diffuse from the p-region to n-region because (a) they move across the junction by the potential difference (b) free electrons available in the n-region attract them (c) the holes concentration in the p-region is greater as compared to n-region (d) all of the above	1	K1	CO2
5. When an SCR is in forward blocking mode, the junctions J1 and J3 are _____. (a) forward biased (b) reverse biased (c) neither forward nor reverse biased (d) both forward and reverse biased	1	K1	CO3
6. Which of the following is not a fundamental component of an IoT system? (a) Sensors (b) Connectivity and data processing (c) User interface (d) Transformer	1	K1	CO3
7. Identify the origin of magnetism..... (a) Charged particles alone (b) Movement of charged particle (c) Magnetic dipole (d) Magnetic domains	1	K1	CO4
8. The polarization which occurs due to the presence of polar molecules in dielectrics is..... (a) Ionic Polarization (b) Electric polarization (c) Space charge polarization (d) Orientation Polarization	1	K1	CO4
9. Which process of the electron-hole pair is responsible for emitting of light? (a) Generation (b) Movement (c) Recombination (d) Diffusion	1	K1	CO5
10. Quantum confinement occurs when the size of the material is..... (a) Much larger than the Bohr exciton radius (b) Equal to the wavelength of visible light (c) Comparable to or smaller than the Bohr exciton radius (d) Infinite	1	K2	CO6

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

11. What is periodic potential?	2	K1	CO1
12. Justify the negative mass of electrons.	2	K2	CO1
13. Write the diode current equation.	2	K1	CO2
14. Distinguish the carrier transport process in semiconductors.	2	K2	CO2
15. Define pinch-off voltage.	2	K1	CO3

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| 16. Summarize the applications of CCD. | 2 | K2 | CO3 |
| 17. What are paramagnetic materials? Give example. | 2 | K1 | CO4 |
| 18. Brief the remedies for dielectric breakdown. | 2 | K2 | CO4 |
| 19. State any two applications of nonlinear optics. | 2 | K1 | CO5 |
| 20. Identify the types of electromagnetic radiation that can transmit through metals and justify their ability to do so. | 2 | K2 | CO5 |
| 21. Define quantum confinement. | 2 | K2 | CO6 |
| 22. Mention the ways to tune the light emission from a quantum dot. | 2 | K2 | CO6 |

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

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| 23. a) | Derive an expression for the density of states using quantum free electron theory of solids. | 11 | K3 | CO1 |
| OR | | | | |
| b) | Choose among the electron models, which model explains the classification of materials based on conduction; illustrate the model with a neat sketch. | 11 | K3 | CO1 |
| 24. a) | Derive an expression for the density of electrons in an intrinsic semiconductor with a neat energy band diagram. | 11 | K3 | CO2 |
| OR | | | | |
| b) | Show that the density of holes is proportional to the square root of the acceptor concentration in p-type semiconductor at low temperatures. | 11 | K3 | CO2 |
| 25. a) | Demonstrate the construction and working of an NPN transistor with a neat diagram. | 11 | K2 | CO3 |
| OR | | | | |
| b) | Explain the construction, working operation, and characteristics of UJT with a neat sketch. | 11 | K2 | CO3 |
| 26. a) (i) | Differentiate hard and soft magnetic materials with examples. | 6 | K2 | CO4 |
| (ii) | Use domain theory to interpret the B-H curve of a ferromagnetic behavior. | 5 | K2 | CO4 |
| OR | | | | |
| b) | Deduce an expression for internal field in dielectric by using Lorentz method. | 11 | K2 | CO4 |
| 27. a) | Explain the principle, construction and working of LED with an energy band diagram. | 11 | K2 | CO5 |
| OR | | | | |
| b) | Explain in detail the electro-optic modulators based on the Franz-Keldysh and Stark effects. | 11 | K2 | CO5 |
| 28. a) | Make use of quantum confinement and derive the density of states of a quantum well, quantum wire. | 11 | K3 | CO6 |
| OR | | | | |
| b) | Apply the nano size effects to explain the dimensional effects, properties of carbon nano tubes? Mention its applications. | 11 | K3 | CO6 |