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| **20CB/DS/CM102/PH03**  **Hall Ticket Number:**   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  | |  |  |  |  |  |  |  |  | | **I/IV B.Tech(Regular/Supplementary)DEGREE EXAMINATION** | | | | | | | | | | | **February, 2024** | | | | | | | **Common to CB, DS & CM Branches** | | | | **First Semester** | | | | | | | **Semiconductor Physics &Nano materials** | | | | **Time: Three Hours** | | | | | | | **Maximum:70 Marks** | | | |
| |  |  | | --- | --- | | *Answer* ***Question NO. 1*** *compulsorily.* | (14X1 = 14 Marks) | | *Answer* ***ONE*** *questions from each unit.* | (4X14=56 Marks) | |
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|  |  |  | CO | BL | M |
| 1 | a) | List out any two successive failures of Somerfield free electron theory | CO1 | L1 | 1M |
|  | b) | List any two differences between metals, semiconductors and insulators. | CO1 | L3 | 1M |
|  | c) | Explain the concept of hole? | CO1 | L3 | 1M |
|  | d) | Define Fermi level. | CO1 | L4 | 1M |
|  | e) | Mention any two materials of interest for opto-electronic devices. | CO2 | L2 | 1M |
|  | f) | How a P-type semiconductor is formed? | CO2 | L4 | 1M |
|  | g) | How does the resistance change with rise of temperature in an intrinsic semiconductor | CO2 | L4 | 1M |
|  | h) | What is a donor level? | CO2 | L4 | 1M |
|  | i) | Write the principle of photovoltaic cell | CO3 | L4 | 1M |
|  | j) | Write the full form of LED and LCD | CO3 | L2 | 1M |
|  | k) | Define Faraday effect? | CO3 | L4 | 1M |
|  | l) | Define nanotechnology | CO4 | L4 | 1M |
|  | m) | List out any two properties of carbon nano tubes | CO4 | L1 | 1M |
|  | n) | Write the principle of XRD | CO4 | L3 | 1M |
| **Unit-I** | | | | | |
| 2 | a) | Define and deduce the expression for the density of states. | CO1 | L1 | 9M |
|  | b) | Compare Direct and Indirect band gap semiconductors | CO1 | L1 | 5M |
| **(OR)** | | | | | |
| 3 | a) | Evaluate the expression for Effective Mass of an Electron moving in Energy bands of a solid. | CO1 | L1 | 6M |
|  | b) | Explain Somerfield free electron theory. | CO1 | L3 | 8M |
| **Unit-II** | | | | | |
| 4 | a) | Discuss the formation and working mechanism of p-n junction diode in forward and  reverse bias with neat sketch? | CO2 | L2 | 9M |
|  | b) | Variation of Fermi energy level with temperature in N-type Extrinsic semiconductor. | CO2 | L2 | 5M |
| **(OR)** | | | | | |
| 5 | a) | Derive an expression for the density of holes in the valence band of an intrinsic semiconductor | CO2 | L3 | 8M |
|  | b) | Compare Schottky and Ohmic junctions | CO2 | L1 | 6M |
| **Unit-III** | | | | | |
| 6 | a) | Discuss the principle, construction and working mechanism of solar cell. | CO3 | L1 | 9M |
|  | b) | Examine Kerr effect and explain with neat diagram. | CO3 | L2 | 5M |
| **(OR)** | | | | | |
| 7 | a) | Explain the principle, construction, working of LED. | CO3 | L2 | 9M |
|  | b) | Distinguish PIN and APD | CO3 | L1 | 5M |
| **Unit-IV** | | | | | |
| 8 | a) | Explain briefly various types of carbon nano tubes | CO4 | L2 | 8M |
|  | b) | Write a short note on 1. Surface to volume ratio 2. Quantum confinement | CO4 | L3 | 6M |
| **(OR)** | | | | | |
| 9 | a) | Develop the preparation of nano materials by Chemical Vapour deposition Technique | CO4 | L3 | 8M |
|  | b) | Summarize the applications of nano materials. | CO4 | L2 | 6M |

