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| **20CSE/EEE/EIE/IT202/PH03**  **Hall Ticket Number:**   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | | **I/IV B.Tech(Regular/Supplementary) DEGREE EXAMINATION** | | | | **September,2022** | **Common to CSE,EEE,EIE&IT Branches** | | | **Second Semester** | **Semiconductor Physics & Nano materials** | | | **Time: Three Hours** | | **Maximum:70 Marks** | |  |
| |  |  | | --- | --- | | ***Answer question 1 compulsory.*** | **(14X1 = 14 Marks)** | | ***Answer one question from each unit.*** | **(4X14=56 Marks)** | |  |

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|  |  |  | | **M** | | **CO** | **BL** |
| 1. | a) | Mention any two drawbacks of Sommerfeld free electron theory. | |  | | CO1 | 2 |
|  | b) | Explain the concept of hole in a semiconductor. | |  | | CO1 | 2 |
|  | c) | Define Fermi level. | |  | | CO1 | 2 |
|  | d) | How a p-type semiconductor is formed. | |  | | CO2 | 2 |
|  | e) | How does the resistance change with rise of temperature in an intrinsic semiconductor? | |  | | CO2 | 2 |
|  | f) | Illustrate the position of Fermi level in an N-type semiconductor. | |  | | CO2 | 2 |
|  | g) | Mention any two materials of interest for opto-electronic devices. | |  | | CO2 | 2 |
|  | h) | Give two examples for elemental and compound semiconductors. | |  | | CO2 | 2 |
|  | i) | Define dark current. | |  | | CO3 | 2 |
|  | j) | Compare LCD and LED. | |  | | CO3 | 2 |
|  | k) | Write the principle of photovoltaic cell. | |  | | CO3 | 2 |
|  | l) | Why nanomaterials exhibit different properties. | |  | | CO4 | 2 |
|  | m) | What is laser ablation? | |  | | CO4 | 2 |
|  | n) | Define nanotechnology. | |  | | CO4 | 2 |
| **Unit –I** | | | | | | |  |
| 2. | a) | Explain briefly the Sommerfeld free electron theory of metals. | 7M | | CO1 | | 3 |
|  | b) | Write note on direct and indirect band gap semiconductors. | 7M | | CO1 | | 4 |
| **(OR)** | | | | | | |  |
| 3. | a) | Explain the origin of energy bands in solids using Kronig-Penny model. | 7M | | CO1 | | 3 |
|  | b) | Discuss the expression for the density of states. | 7M | | CO1 | | 4 |
| **Unit –II** | | | | | | |  |
| 4. | a) | Derive an expression for the density of holes in the valence band of an intrinsic semiconductor. | 7M | | CO2 | | 4 |
|  | b) | Describe and deduce expressions for the drift and diffusion currents in a semiconductor. | 7M | | CO2 | | 3 |
| **(OR)** | | | | | | |  |
| 5. | a) | Explain the formation of potential barrier across the P-N junction diode. | 7M | | CO2 | | 3 |
|  | b) | Compare Schottky and Ohmic junctions. | 7M | | CO2 | | 4 |
| **Unit –III** | | | | | | |  |
| 6. | a) | Explain the working principle of Solar cell with neat diagram. | 7M | | CO3 | | 3 |
|  | b) | Explain the principle and working of LED. | 7M | | CO3 | | 4 |
| **(OR)** | | | | | | |  |
| 7. | a) | Differentiate between PIN and APD. | 7M | | CO3 | | 4 |
|  | b) | Define Kerr effect and explain with neat diagram. | 7M | | CO3 | | 3 |
| **Unit –IV** | | | | | | |  |
| 8. | a) | How do the various properties of nanomaterials vary with their size? | 7M | | CO4 | | 4 |
|  | b) | Explain the synthesis of Nanomaterials by CVD method with neat diagram. | 7M | | CO4 | | 3 |
| **(OR)** | | | | | | |  |
| 9. | a) | Describe briefly the various types of carbon nanotubes. | 7M | | CO4 | | 4 |
|  | b) | Explain briefly the important applications of carbon nanotubes. | 7M | | CO4 | | 3 |

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