**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 = 14Marks)** |
| ***Answer one question from each unit.*** | | | **(4X14=56 Marks)** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  | CO | BL | M |
| 1 | a) | Mention any two drawbacks of Sommerfeld free electron theory. | CO1 | L1 | 1M |
|  | b) | Explain the concept of hole in a semiconductor. | CO1 | L1 | 1M |
|  | c) | Define Fermi level. | CO1 | L1 | 1M |
|  | d) | How a p-type semiconductor is formed. | CO2 | L1 | 1M |
|  | e) | How does the resistance change with rise of temperature in an intrinsic semiconductor? | CO2 | L1 | 1M |
|  | f) | Illustrate the position of Fermi level in an N-type semiconductor. | CO2 | L1 | 1M |
|  | g) | Mention any two materials of interest for opto-electronic devices. | CO2 | L1 | 1M |
|  | h) | Give two examples for elemental and compound semiconductors. | CO2 | L1 | 1M |
|  | i) | Define dark current. | CO3 | L1 | 1M |
|  | j) | Compare LCD and LED. | CO3 | L1 | 1M |
|  | k) | Write the principle of photovoltaic cell. | CO3 | L1 | 1M |
|  | l) | Why nanomaterials exhibit different properties. | CO4 | L1 | 1M |
|  | m) | What is laser ablation? | CO4 | L1 | 1M |
|  | n) | Define nanotechnology. | CO4 | L1 | 1M |
| **Unit-I** | | | | | |
| 2 | a) | Explain briefly the Sommerfeld free electron theory of metals. | CO1 | L3 | 7M |
|  | b) | Write note on direct and indirect band gap semiconductors. | CO1 | L4 | 7M |
|  |  | **(OR)** |  |  |  |
| 3 | a) | Explain the origin of energy bands in solids using Kronig-Penny model. | CO1 | L3 | 7M |
|  | b) | Discuss the expression for the density of states. | CO1 | L4 | 7M |
| **Unit-II** | | | | | |
| 4 | a) | Derive an expression for the density of holes in the valence band of an intrinsic semiconductor. | CO2 | L4 | 7M |
|  | b) | Describe and deduce expressions for the drift and diffusion currents in a semiconductor. | CO2 | L3 | 7M |
| **(OR)** | | | | | |
| 5 | a) | Explain the formation of potential barrier across the P-N junction diode. | CO2 | L3 | 7M |
|  | b) | Compare Schottky and Ohmic junctions. | CO2 | L4 | 7M |
| **Unit-III** | | | | | |
| 6 | a) | Explain the working principle of Solar cell with neat diagram. | CO3 | L3 | 7M |
|  | b) | Explain the principle and working of LED. | CO3 | L4 | 7M |
| **(OR)** | | | | | |
| 7 | a) | Differentiate between PIN and APD. | CO3 | L4 | 7M |
|  | b) | Define Kerr effect and explain with neat diagram. | CO3 | L3 | 7M |
| **Unit-IV** | | | | | |
| 8 | a) | How do the various properties of nanomaterials vary with their size? | CO4 | L4 | 7M |
|  | b) | Explain the synthesis of Nanomaterials by CVD method with neat diagram. | CO4 | L3 | 7M |
| **(OR)** | | | | | |
| 9 | a) | Describe briefly the various types of carbon nanotubes. | CO4 | L2 | 7M |
|  | b) | Explain briefly the important applications of carbon nanotubes. | CO4 | L3 | 7M |



**\*\*\* Remove the border lines after typing the QP**