**20CS/EE/EI/IT 202**

**Hall Ticket Number:**

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| **I/IV B.Tech (Regular) DEGREE EXAMINATION**  **Common for CS,EE,EI & IT** | | | |
| **October, 2021** | **Semiconductor Physics & Nanomaterials** | | |
| **Second Semester** |  | | |
| **Time:** Three Hours | | **Maximum:** 70 Marks | |
| ***Answer question 1 compulsory.*** | | | **(14X1 = 14Marks)** |
| ***Answer one question from each unit.*** | | | **(4X14=56 Marks)** |

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|  |  |  | CO | | | BL | | M |
| 1 | a) | What are indirect band gap semiconductors? | CO1 | | | L1 | | 1M |
|  | b) | Define Fermi energy. | CO1 | | | L1 | | 1M |
|  | c) | How Metals, Semiconductors and Insulators differ from one another. Justify | CO1 | | | L1 | | 1M |
|  | d) | State drift current | CO2 | | | L1 | | 1M |
|  | e) | Differentiate Intrinsic and Extrinsic semiconductors. | CO2 | | | L1 | | 1M |
|  | f) | List any two applications of semiconductors. | CO2 | | | L1 | | 1M |
|  | g) | Give the equation for continuity. | CO2 | | | L1 | | 1M |
|  | h) | State Faraday effect. | CO3 | | | L1 | | 1M |
|  | i) | Define photo voltaic effect. | CO3 | | | L1 | | 1M |
|  | j) | How LED is different from Laser? | CO3 | | | L1 | | 1M |
|  | k) | Define Bragg's law. | CO4 | | | L1 | | 1M |
|  | l) | What are zero and one dimensional confinements? | CO4 | | | L1 | | 1M |
|  | m) | Mention any two properties of nanomaterials. | CO4 | | | L1 | | 1M |
|  | n) | In what way carbon nano tubes are helpful? | CO4 | | | L1 | | 1M |
| **Unit-I** | | | | | | | | |
| 2 | a) | Derive an expression for density of energy states in metals using carrier concentration. | CO1 | | L4 | | 10M | |
|  | b) | List out the failures of sommerfeld free electron theory. | CO1 | | L2 | | 4M | |
|  |  | **(OR)** |  | |  | |  | |
| 3 | a) | Define effective mass of an electron and derive an expression for the same. | CO1 | | L3 | | 10M | |
|  | b) | Explain in brief the concept of hole. | CO1 | | L3 | | 7M | |
| **Unit-II** | | | | | | | | |
| 4 | a) | What are Intrinsic semiconductors derive an expression for carrier concentration in Intrinsic semiconductors | | CO2 | | L3 | | 10M |
|  | b) | Differentiate n-type and p-type semiconductors | | CO2 | | L4 | | 4M |
| **(OR)** | | | | | | | | |
| 5 | a) | Explain various biasing conditions and I-V characteristics of PN junction diode | | CO2 | | L3 | | 10M |
|  | b) | List few materials used in manufacturing of opto-electronic devices | | CO2 | | L2 | | 4M |
| **Unit-III** | | | | | | | | |
| 6 | a) | Explain the principle, construction and working of LED | | CO3 | | L3 | | 10M |
|  | b) | List any four applications of photo diode | | CO3 | | L3 | | 4M |
| **(OR)** | | | | | | | | |
| 7 | a) | Describe Working of PIN and APD diode. | | CO3 | | L3 | | 10M |
|  | b) | Explain Kerr effect with neat labelled sketch. | | CO3 | | L3 | | 4M |
| **Unit-IV** | | | | | | | | |
| 8 | a) | List the properties of the nanomaterials. | | CO4 | | L2 | | 6M |
|  | b) | How nanoparticles are prepared by laser ablation method, Explain. | | CO4 | | L3 | | 8M |
| **(OR)** | | | | | | | | |
| 9 | a) | Short notes on types, properties and applications of CNT's. | | CO4 | | L2 | | 6M |
|  | b) | Explain principle, construction and working of Scanning Electon Microscope. | | CO4 | | L3 | | 8M |



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