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

**Hall Ticket Number:**

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| **I/IV B.Tech (Regular) DEGREE EXAMINATION** | | | |
| **October, 2021** | **Common for CS,EE,EI & IT** | | |
| **Second Semester** | **Semiconductor Physics & Nanomaterials** | | |
| **Time:** Three Hours | | **Maximum: 7**0 Marks | |
| *Answer Question No. 1 Compulsorily.* | | | (14X1 = 14 Marks) |
| *Answer* ***ONE*** *question from each Unit.* | | | (4X14=56 Marks) |

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

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