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**SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR**  
(AUTONOMOUS)**B.Tech I Year II Semester Regular Examinations October-2020****SEMICONDUCTOR PHYSICS****(Electronics & Communication Engineering)**

Time: 3 hours

Max. Marks: 60

(Answer all Five Units **5 x 12 = 60** Marks)**UNIT-I**

- 1 a Using classical free electron theory, derive an expression for electrical conductivity in metal. **8M**  
 b Find relaxation time of conduction electron in metal if its resistivity is  $1.54 \times 10^{-8} \Omega\text{-m}$  and it has  $5.8 \times 10^{28}$  conduction electron/ $\text{m}^3$ . Given  $m = 9.1 \times 10^{-31}$  kg,  $e = 1.6 \times 10^{-19}$  C. **4M**

**OR**

- 2 a Classify conductor, semiconductor and insulators based on band theory of solids. **8M**  
 b Evaluate Fermi Function for energy  $K_B T$  above Fermi level? **4M**

**UNIT-II**

- 3 a Derive the expression for current generated due to drifting of charge carriers in semiconductors in the presence of electric field. **6M**  
 b What is Fermi level? Prove that the Fermi level lies exactly in between conduction band and valance band of intrinsic semiconductor. **6M**

**OR**

- 4 a Describe the construction and working mechanism of Photodiode. **8M**  
 b Find the diffusion co-efficient of electron in Si at 300 K if  $\mu_e = 0.19 \text{ m}^2\text{-V}^{-1}\text{S}^{-1}$ . **4M**

**UNIT-III**

- 5 a Derive Schrödinger's time independent wave equation. **8M**  
 b Explain the physical significance of wave function. **4M**

**OR**

- 6 a State and Explain Stoke's and Gauss's Theorems? **8M**  
 b Explain Ampere's law through the Maxwell equations. **4M**

**UNIT-IV**

- 7 a Describe the construction and working principle of He-Ne Laser with the help of a neat diagram. **9M**  
 b Write the applications of Lasers. **3M**

**OR**

- 8 a Describe the construction and the working principle of optical fiber. **8M**  
 b Mention applications of optical fibers. **4M**

**UNIT-V**

- 9 a Explain the concept of Quantum Confinement in Nano materials. **6M**  
 b Write the applications of nanomaterial in industries and information technology. **6M**

**OR**

- 10 a Explain Sol-Gel technique for synthesis of nanomaterial. **8M**  
 b Write the applications of nanomaterial in various fields. **4M**

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