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SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR  
(AUTONOMOUS)

B.Tech I Year II Semester Supplementary Examinations Dec 2019

SEMICONDUCTOR PHYSICS

(Common to ECE, CSE, CSIT)

Time: 3 hours

Max. Marks: 60

**PART-A**

- 1 a State the Pauli's exclusion principle. 2M
- b What is Hall effect? 2M
- c Mention the applications of photo diode. 2M
- d Define Numerical aperture and acceptance angle of an optical fibre. 2M
- e Describe graphene based FET. 2M

**PART-B**

(Answer all Five Units 5 x 10 = 50 Marks)

**UNIT-I**

- 2 a Write brief note on origin of energy bands in solids with neat sketch. 5M
- b Explain the existence of allowed and forbidden bands in solids using E-K diagram. 5M

OR

- 3 a What are Brillouin zone? Write the corresponding K (wave vector) values of first and second Brillouin zone. 4M
- b Define Fermi energy level. Find the temperature at which there is 1% probability that a state with energy 0.5 eV is above Fermi energy. 6M

**UNIT-II**

- 4 a What is Fermi level? Prove that the Fermi level lies exactly in between conduction band and valance band of intrinsic semiconductor. 5M
- b Derive Einstein's relation in semiconductors. 5M

OR

- 5 a Explain the concept of charge carriers generation and recombination. 5M
- b Find the diffusion co-efficient of electron in Si at 300 K if  $\mu_e = 0.19 \text{ m}^2\text{-V}^{-1}\text{-S}^{-1}$ . 5M

**UNIT-III**

- 6 a What are the materials used for fabrication of LED's? 4M
- b Explain the structure and mechanism of LED's. 6M

OR

- 7 a Designate the charge carrier generation and separation mechanism in solar cells with respect to the solar light illumination. 5M
- b Suggest the suitable semiconductors with optimum band gap for fabrication of solar cells. 5M

**UNIT-IV**

- 8 a Explain the different pumping mechanisms in laser. 6M
- b Mention the application of laser in different fields. 4M

OR

- 9 a An optical fibre has a numerical aperture of 0.20 and cladding refractive index of 1.59. 3M
- b What is the numerical aperture of an optical fibre? and derive an expression for it. 7M

**UNIT-V**

- 10 a Explain the concept of Quantum Confinement in nano materials. 4M
- b Write the applications of nanomaterial in industries and information technology. 6M

OR

- 11 What are allotropes? Write in details about allotropes of Carbon. 10M

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