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**B.E. / B.TECH. DEGREE EXAMINATIONS, DEC 2019**

Sixth Semester

**EE16006 – SOLID STATE DEVICES***(Electrical and Electronics Engineering)***(Regulation 2016)****Time: Three Hours****Maximum : 100 Marks**

Answer ALL questions

**PART A - (10 X 2 = 20 Marks)**

	<b>CO</b>	<b>RBT</b>
1. What are different carrier scattering mechanisms?	<b>1</b>	<b>U</b>
2. Sketch the energy band diagram of a PN junction at equilibrium condition.	<b>1</b>	<b>AP</b>
3. What is Hall effect and hall voltage?	<b>2</b>	<b>U</b>
4. Define quasi Fermi level. When do they exist?	<b>2</b>	<b>U</b>
5. Write the Ideal diode equation.	<b>3</b>	<b>AP</b>
6. Explain the term avalanche break down.	<b>3</b>	<b>U</b>
7. Differentiate drift and diffusion current.	<b>3</b>	<b>U</b>
8. Differentiate direct and indirect recombination process.	<b>3</b>	<b>U</b>
9. Define hetero junction.	<b>4</b>	<b>U</b>
10. State the different types of p-n junction model.	<b>4</b>	<b>R</b>

**PART B - (5 X16 = 80 Marks)**

11. (a) Derive the expression for electron, hole and intrinsic concentrations at equilibrium. **(16)** **1** **AN**

**(OR)**

- (b) Explain the band diagram, Fermi - Dirac distribution and carrier concentration for intrinsic and extrinsic semi-conductor at thermal equilibrium. **(16)** **1** **U**
12. (a) (i) Explain the effects of temperature and doping dependence on mobility, charge carrier concentration. **(10)** **2** **AN**

- (ii) Prove that under steady state carrier injection, the injected excess carrier concentration is an exponentially decreasing function of distance. **(6)**

**(OR)**

- (b) Describe diffusion process. Derive the expression for diffusion current density. **(16) 2 U**
13. (a) Explain in detail about space charge and electric field distribution at P-N junction. **(16) 3 U**

**(OR)**

- (b) Explain about the forward and reverse biased junctions in steady state conditions. **(16) 3 U**
14. (a) Deduce the expression for depletion and diffusion capacitance of a PN junction. **(16) 3 AN**

**(OR)**

- (b) Explain in detail about the ohmic and rectifying contacts. **(16) 3 AN**
15. (a) Express in detail about the steps involved in deriving a device model. **(16) 4 AN**

**(OR)**

- (b) Design in detail about any one type of modeling of P-N junction diode. **(16) 4 AN**