Reg.No. \_\_\_\_\_\_\_\_\_\_\_\_



**UNIVERSITY**

(Karunya Institute of Technology & Sciences)

(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

**End Semester Examination – Nov/Dec– 2017**

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| **Code :** | **14EC2002** | **Duration :** | **3hrs** |
| **Sub. Name :** | **ELECTRON DEVICES** | **Max. marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | Discuss the relationship between distribution function and Fermi energy at T=0K and T> 0K. | CO1 | 15 |
| b. | Calculate the thermal equilibrium electron concentration in silicon at T=300 K. Assume the Fermi energy is 0.25 eV below the conduction band and the value of Nc=2.8×1019 cm-3 | CO1 | 5 |
| (OR) | | | | |
| 2. | a. | Draw the equilibrium distribution of electrons and holes in p type and n type semiconductor and write the mathematical expression for concentration of electrons and holes. | CO1 | 15 |
| b. | Differentiate n type and p-type semiconductor. | CO1 | 5 |
|  |  |  |  |  |
| 3. | a. | Discuss the variation of the Fermi energy with doping concentrations and temperature with necessary expressions and diagrams. | CO1 | 15 |
|  | b. | Compare Drift current and Diffusion current. | CO1 | 5 |
| (OR) | | | | |
| 4. | a. | Explain the principle of Hall effect and derive the expression of Hall voltage and its Coefficient. | CO2 | 15 |
|  | b. | Plot the V-I characteristics of p-n diode. | CO2 | 5 |
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| 5. | a. | Sketch the band structure of an open-circuited pn junction and derive the potential energy of the electrons at the junction(Eo). | CO2 | 15 |
|  | b. | Consider a germanium p-n junction at 3000K with doping concentration NA=1.5×1018 cm-3 and ND=2×1015 cm-3 in the p and n sides of the junction respectively. Determine the contact potential V0 across the junction. Assume the intrinsic carrier concentration of germanium ni=2.5×1013 cm-3 at 3000K and Boltzmann constant k=8.6173×10—5eVK-1. | CO2 | 5 |
| (OR) | | | | |
| 6. | a. | Explain the current components of pn diode for symmetric and non-symmetric doping. | CO3 | 10 |
|  | b. | Draw the small signal model of pn junction and define dynamic resistance, diffusion capacitance and transition capacitance. | CO3 | 10 |
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| 7. | a. | Analyze the input and output characteristics of common emitter configuration of BJT with neat diagrams. | CO2 | 15 |
|  | b. | In a common base connection, current amplification factor(α) is 0.9. If the emitter current is 1 mA, determine the value of base current. | CO2 | 5 |
| (OR) | | | | |
| 8. |  | Explain why BJTs are called bipolar devices while FETs are called unipolar devices? Also explain the operation and applications of FET. | CO2 | 20 |
|  | |  |  |  |
|  | | **Compulsory**: |  |  |
| 9. | a. | Explain in detail the construction, equivalent circuit, working and characteristics of SCR. | CO3 | 15 |
|  | b. | Explain the working principle of Zener diode and its characteristics. | CO3 | 5 |

ALL THE BEST