Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 90462

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2022.

Second Semester

Electronics and Communication Engineering

EC 8252 — ELECTRONIC DEVICES

(Common to : Electronics and Telecommunication Engineering/Medical Electronics)

(Regulations 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define diffusion current.
2. The intrinsic carrier density is 1.5×10^{16} m^{-3}. If the mobility of electron and hole are 0.13 and 0.05 $m^2 V^{-1} s^{-1}$, calculate the conductivity.
3. What is the importance of Early effect in BJT?
4. If α of a transistor is 0.9, calculate β.
5. Compare the properties of FET over BJT.
6. A JFET has a drain current of 5 mA. If I_{DSS} = 10 mA and $V_{GS(off)} = -6$ V, find the value of V_{GS}.
7. Define tunneling effect.
8. State the significance of Gallium Arsenide device.
9. What is SCR and how it works?
10. Mention the application of phototransistor.

PART B — (5 × 13 = 65 marks)

11. (a) Explain the PN junction forward and reverse characteristics and mention its applications.

Or

(b) Calculate the intrinsic concentration of charge carriers at 300 K given that $m_c = 0.12 m_o$, $m_h = 0.28 m_o$ and the value of brand gap = 0.67 eV, $m_o = 9.1 \times 10^{-31} kg\ m^{-3}$.

12. (a) Draw the transistor configurations. Compare common base, common collector configuration of BJT with reference to following point. (i) Input Impedance (ii) Current gain (iii) Voltage gain (iv) Phase shift between input and output signal.

Or

(b) Explain the PNP Transistor operation in Active mode and H -parameter model.

13. (a) With the help of neat diagram, Discuss the construction of n-channel FET. The datasheet of a JFET gives the following information: IDSS = 3 mA, VGS (off) = – 6V and gm (max) = 5000 μS. Determine the transconductance for VGS = – 4V and find drain current ID at this point.

Or

(b) Explain the working of n-channel D-MOSFET. Compare MOSFET with JFET.

14. (a) What is the difference between MOSFET and MESFET? Discuss the features of types of FINFET, CNFET and dual gate MOSFET.

Or

(b) Describe the construction and working principle of laser diode with the help of a neat diagram.

15. (a) What is the difference between UJT and BJT? Explain the Construction, Working, Characteristics Curve and Applications of UJT.

Or

(b) Discuss the principle of operation and application of following :

(i) Opto coupler

(ii) CCD. (7+6)

PART C — (1 × 15 = 15 marks)

16. (a) What is intrinsic semiconductor and explain the formation extrinsic semiconductors through doping? Derive the expression for transition capacitance for Step Graded Junction and linear Graded Junction.

Or

(b) State the significance of Small Signal Low Frequency h-parameter Model, Consider two BJT's biased at the same collector current with area $A_1 = 0.2\mu m \times 0.2\mu m$ and $A_2 = 300\mu m \times 300\mu m$. Assuming that all other device parameters are identical, $kT/q = 26mV$, the intrinsic carrier concentration is $1 \times 10^{10} cm^{-3}$ and $q = 1.6 \times 10^{-19} C$. Find the difference between the base – emitter voltage (in mV) of the two BJT's (i.e. $VBE1 - VBE2$).