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Third Semester B.E. Degree Examination, Dec.2019/Jan.2020 Electronic Devices

Time: 3 hrs.

Max. Marks: 100

Note: Answer FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. What are the types of Bonding forces in solids? Explain. (06 Marks)
- b. Explain the classification of material based on conductivity and energy band diagram. (08 Marks)
- c. Find the conductivity of the intrinsic germanium at 300 K. If a donor type impurity is added to the extent of 1 atom/ 10^7 germanium atom assume $\mu_n = 3800$, $\mu_p = 1800$, $n_i = 2.5 \times 10^3$, $Q = 1.602 \times 10^{-19}$. (06 Marks)

OR

- 2 a. What are Direct and Indirect band gap semiconductor? Explain with examples. (08 Marks)
- b. Explain the concentration of electron-hole pair in Intrinsic semiconductor with energy band diagram. (06 Marks)
- c. Calculate the Intrinsic carrier concentration in Silicon at room temperature $T = 300$ K, where B is the material dependent parameter 5.4×10^{31} and E_G as the bandgap energy 1.12 eV, where K is the Boltzman constant $= 8.62 \times 10^{-5}$ eV/K. (06 Marks)

Module-2

- 3 a. With energy band diagram, explain the doping level in extrinsic semiconductor at 0 K and at 50 K. (09 Marks)
- b. What is the magnitude of HALL voltage in a N-Type germanium bar having an majority carrier concentration $N_D = 10^{17} \text{ cm}^{-3}$. Assume $B = 0.2 \text{ Wb/m}^2$, $d = 2 \text{ mm}$, $E = 10 \text{ V/cm}$. (05 Marks)
- c. Explain the effect of temperature on semiconductor. (06 Marks)

OR

- 4 a. Explain the qualitative description of current flow at P-N junction under equilibrium and biased condition. (08 Marks)
- b. Explain zener breakdown and avalanche breakdown under reverse biased P-N junction. (06 Marks)
- c. Discuss the piece-wise linear approximations of junction diode under ideal condition. (06 Marks)

Module-3

- 5 a. Explain the optical generation of carrier in a P-N junction. (08 Marks)
- b. Discuss the configuration of a solar cell in enlarged view of the planar junction. (06 Marks)
- c. What is injection-electroluminescence and what are its applications? (06 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

OR

- 6 a. Explain I-V characteristics of n-p junction as a function of emitter current. (08 Marks)
 b. Discuss switching operation in common-emitter transistor. (06 Marks)
 c. Figure Q6 (c) shows the common emitter amplifier circuit. Calculate I_B and I_C assume $\tau_p = 10 \mu s$, $\tau_t = 0.1 \mu s$ (06 Marks)

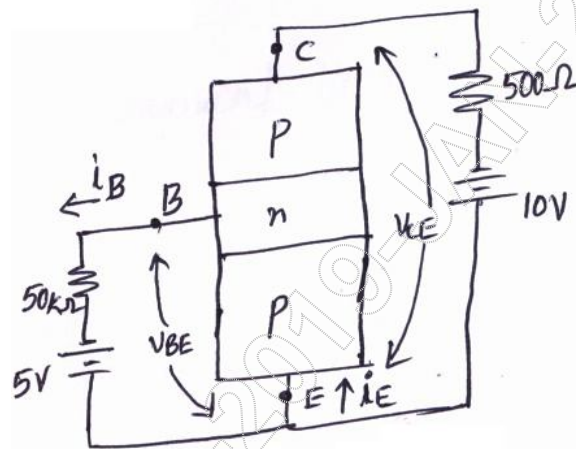


Fig. Q6 (c)

Module-4

- 7 a. Draw and explain the I-V characteristics of n-channel PNJFET for different biasing voltages. (07 Marks)
 b. Draw and explain the small signal equivalent circuit of n-channel PNJFET. (07 Marks)
 c. Explain the MOS structure with the aid of parallel-plate capacitor. (06 Marks)

OR

- 8 a. Explain the effect of frequency on gate voltage of a MOS capacitor with a P-type substrate. (10 Marks)
 b. Explain P-channel enhancement and depletion type MOSFET with their circuit symbols. (10 Marks)

Module-5

- 9 a. With schematic diagram, explain ION-implantation system. (07 Marks)
 b. Explain low pressure chemical vapour deposition reactor. (07 Marks)
 c. Discuss photolithography. (06 Marks)

OR

- 10 a. What are the different types of integrated circuits and its advantages? (10 Marks)
 b. Explain the process of Integration. (10 Marks)
