CBCS SCHEME

USN | | | | | | | | | | 18EC33

# 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 forceses 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 donar type impurity is added to the extent of 1 atom/$10^7$ germanium atom assume $\mu_n = 3800$, $\mu_p = 1800$, $n_i = 2.5\times10^3$, $Q = 1.602\times10^{-19}$. **(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 $5.4\times10^{31}$ and $E_G$ as the bandgap energy 1.12 eV, where K is the Boltzman constant = $8.62\times10^{-5}$ 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 $N_D = 10^{17}$ cm$^3$. Assume B = 0.2 Wb/m$^2$, d = 2 mm, E = 10 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-electroluminiscence and what are its applications? **(06 Marks)**

**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)**

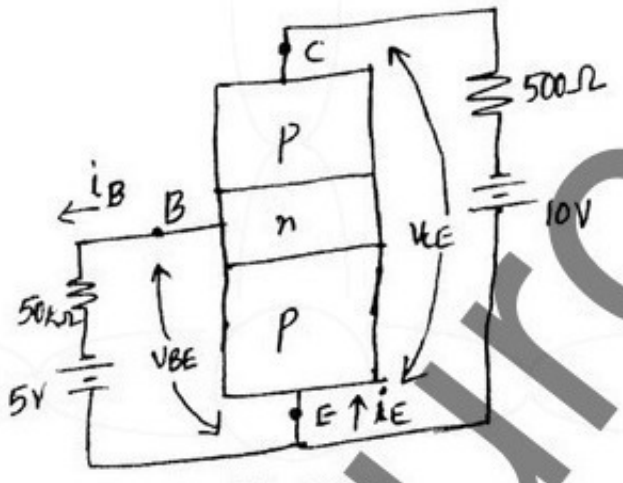


Fig. Q6 (c)

## 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)**

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