

002 - Electronics Devices

P. Pages : 2

Time : Three Hours



GUG/S/23/13907

Max. Marks : 80

- Notes :
1. All questions carry equal marks.
 2. Assume suitable data wherever necessary.
 3. Illustrate your answer wherever necessary with the help of neat sketches.

1. a) What is extrinsic semiconductor? Explain the formation of p-type and n-type of semiconductor materials. **8**
- b) A bar of intrinsic germanium 6cm long is subjected to a potential difference of 12V. If the velocity of electrons in bar is 73 m/s. Determine the mobility of electrons. **8**

OR

2. a) Prove that **8**
- $$n_p = \frac{ni^2}{NA}$$
- b) Find the resistivity of intrinsic silicon at the temperature of 27°C. Assume intrinsic concentration of silicon at 300°K as 1.5×10^{10} per cm^3 . Concentration of free electrons as $1300 \text{ cm}^2/\text{v-sec}$ and that of holes as $500 \text{ cm}^2/\text{v-sec}$. **8**
3. a) Which are the various components of a current flowing through a forward biased diode. Show the graph of current components against the distance from the junction. **8**
- b) A diode with reverse saturation current of 10^{-12} A is connected in parallel across a diode with reverse saturation current of 10^{-10} A. The circuit is connected across a battery of voltage V. If the total current of the circuit is 2 mA. Calculate the voltage across each diode. Assume germanium diode. **8**

OR

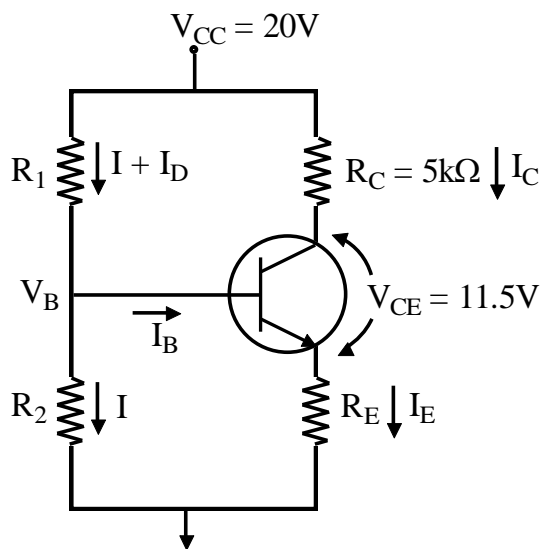
4. a) Explain avalanche and Zener breakdown. **8**
- b) Explain transition and diffusion capacitance of diode with their mathematical equation. **8**
5. a) Derive the expression for the ripple factor of a full wave rectifier with capacitor input filter. **8**
- b) What should be the value of inductance to use in an inductor filter connected to a full wave rectifier operating at 50 Hz, if the ripple is not to exceed 5% for a 100Ω load. Repeat the above problem for the standard aircraft power frequency of 400Hz. **8**

OR

6. a) A $5\text{ K}\Omega$ load is fed from a bridge connected across a transformer secondary whose primary is connected to 460 V, 50 Hz supply. The ratio of number of primary turns to secondary turns is 2:1. Calculate d. c load current, d. c load voltage, ripple voltage and P.I.V. rating of diode. 8
- b) What is filter. Explain capacitor filter with their input, output waveform and mathematical expression of ripple factor. 8
7. a) Define α_{dc} , β_{dc} , and γ_{dc} . Derive the relation between α_{dc} , β_{dc} , and γ_{dc} of transistor. 8
- b) For JFET if $I_{DSS} = 20\text{mA}$, $V_{GS(\text{off})} = -5\text{V}$ and $g_{m0} = 4\text{mS}$. Determine the transconductance for $V_{GS} = 4\text{V}$ and I_D at this point. 8

OR

8. a) With the help of neat diagram and characteristics curve explain operation of enhancement type MOSFET. 8
- b) Calculate the values of collector current and base current for a transistor with $\alpha_{dc} = 0.99$ and $I_{CBO} = 10\mu\text{A}$. The emitter current is measured as 8mA. 8
9. a) Draw the circuit of I_{CO} bias compensation and explain how it works. 8
- b) Shown in following fig. a silicon transistor with $\beta_{dc} = 50$ is used in self biasing arrangement with $V_{CC} = 20\text{V}$, $R_C = 5\text{ k}\Omega$. The operating point -Q is at $V_{CE} = 11.5\text{V}$, $I_C = 1.5\text{mA}$. Find values of R_1 , R_2 and R_E 8



OR

10. a) Define Stability factor and thermal runaway. Derive and explain the condition to avoid thermal runaway. 8
- b) Draw the neat diagram of voltage divider biasing configuration and Derive its stability factor S. 8
