

B.E. Electronics & Communication/Telecommunication Engineering (Model Curriculum) Sem-III
002 : Electronic Devices

P. Pages : 2

Time : Three Hours



GUG/W/22/13907

Max. Marks : 80

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

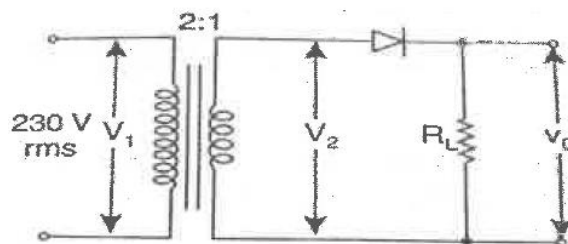
1. a) Describe the Hall effect and explain its relation to mechanical force exerted by magnetic field on conduction. **8**
- b) Explain the Fermi level in intrinsic and extrinsic semiconductor with their energy band diagram. **8**

OR

2. a) Prove that the conductivity of a semiconductor is **8**
$$\sigma = (n\mu_n + p\mu_p)q$$
- b) Calculate the conductivity of copper having density 8.9 gm/cm^3 and mobility $34.8 \text{ cm}^2/\text{v-sec}$. Atomic weight of copper is 63.57 while it has 1 valence electron per atom. Assume the value of $M = 1.66 \times 10^{-27} \text{ kg}$. **8**
3. a) A germanium diode has a reverse saturation current of $3 \mu\text{A}$. Calculate the voltage at which 1% of the rated current will flow through the diode, at room temperature if diode is rated for 1 A. **8**
- b) Explain the V – I characteristics of pn junction diode with their current equations. **8**

OR

4. a) Derive the expression for the dynamic resistance of a diode. **8**
- b) Write in details about the two types of capacitance associated with a diode. **8**
5. a) What is filter? Explain capacitor filter with their input, output waveform and mathematical expression of ripple factor. **8**
- b) A half wave rectifier circuit with a transformer coupled input shown in following figure **8**



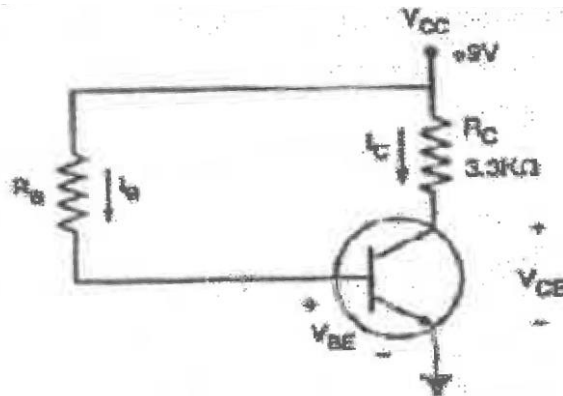
Determine the maximum and average values of power delivered to the load.
Take R_L equal to 200Ω .

OR

6. a) What is ripple factor? Prove that the ripple factor of a full wave rectifier is 0.482. 8
- b) Derive expression for I_{dc} , V_{dc} , I_{rms} and V_{rms} for full wave rectifier. 8
7. a) What is transistor? Explain the working of npn transistor with their current equation. 8
- b) If the base current in a transistor is $20 \mu A$ when the emitter current is 6.4 mA , what are the values of α_{dc} & β_{dc} . Also calculate the collector current. 8

OR

8. a) For a certain transistor, $I_C = 5.255 \text{ mA}$, $I_B = 100 \mu A$ and $I_{CBO} = 5 \mu A$. 8
- a) Calculate α_{dc} , β_{dc} and I_E .
- b) Determine the new level of I_B of required to make $I_C = 15 \text{ mA}$
- b) Draw the circuit for obtaining drain and transfer characteristics for an n-channel JFET. Explain drain and transfer characteristics. 8
9. a) What are the requirements of biasing circuits? Which biasing method provides more stabilization amongst the biasing methods and why. 8
- b) For the transistor shown in following fig. the value of $\beta_{dc} = 100$. Calculate the value of R_B that will just saturate the transistor. Assume $V_{CEsat} = 0.3 \text{ V}$. 8



OR

10. a) Draw the circuit diagram of fixed bias circuit. Why it is called a fixed bias circuit? Drive the expression for stability factor. 8
- b) Design a fixed biased circuit using a silicon transistor having $\beta_{dc} = 100$, $V_{CC} = 10 \text{ V}$ and dc bias conditions are to be $V_{CE} = 5 \text{ V}$ and $I_C = 5 \text{ mA}$. 8
