B.E. / B.Tech. Electronics & Communication/Telecommunication Engineering (Model Curriculum)
Semester-III

SE102 / 002 - Electronics Devices

P. Pages : 2 **GUG/S/25/13907**

Time : Three Hours * 2 3 1 7 * 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) Find the concentration of holes and electrons in a p-type silicon at 300ºK assume resistivity as $0.02\Omega - cm$. **8**

Assume $\mu p = 475 cm^2 / v - sec$

$ni = 1.45 \times 10^{10} \text{per } cm^3$

b) What is Fermi dirac function. Explain the Fermi Level in intrinsic and extrinsic semiconductor with neat energy band diagram. **8**

OR

2. a) Describe the phenomenon of diffusion of charge carriers in semiconductor. **4**

b) Define **4**

i) Static resistance ii) Dynamic resistance
iii) Junction resistance iv) Reverse resistance of diode

c) Derive the condition of dynamic equilibrium for the density of charge carrier for conductivity equation. **8**

3. a) Derive the V-I characteristics of P-n junction diode. **8**

b) What is Zener diode. Explain Zener as a voltage regulator. **8**

OR

4. a) What is transition capacitance. Prove that the mathematical expression of transition capacitance. **8**

b) The diode current is 0.6 mA when the applied voltage is 400mV and 20mA when the applied voltage is 500mV. Determine η. Assume $\frac{kT}{q} = 25mV$. **8**

5. a) Compare HWR, FWR and BWR with respect to following points. **8**

i) Average dc current ii) RMS current
iii) DC power output iv) AC power input
v) Maximum rectifier efficiency. vi) Ripple factor
vii) PIV viii) TUF.

b) What is rectifier. Explain the operation of full wave centre tap rectifier with capacitor filter. Also draw its input and output waveforms. **8**

OR

6. a) What filter. Drive the expression of ripple factor for capacitor filter. **8**

b) Determine the ripple factor of an L-type choice input filter comprising a 10 H choke and $8\mu f$ capacitor used with a full wave rectifier. Compare with a simple $80\mu f$ capacitor input filter at a load current of 50 mA and also 150 mA. Assume the dc voltage of 50V. **8**

7. a) What is JFET. with the help of neat diagram explain the operation of an n-channel JFET. Show the internal depletion regions and explain their shapes. **8**

b) Explain. **8**

i) Punch through effect. ii) Ebers moll model of transistor.

OR

8. a) Prove that **8**

$$I_{CEO} = (\beta_{dc} + 1)\, I_{CBO}$$

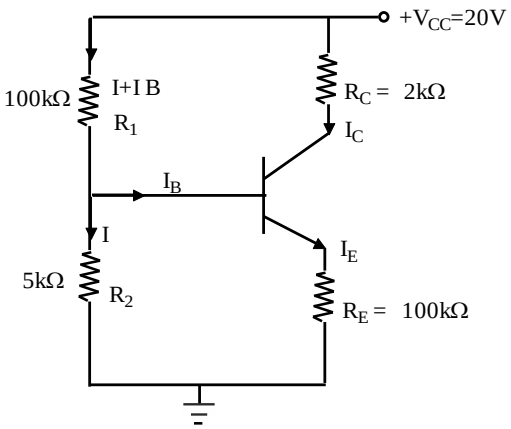
b) With the help of neat diagram show different current components in the transistor and define. **8**

i) Emitter efficiency.
ii) Transport factor.
iii) Large signal current gain.

9. a) Draw and explain the collector to base bias circuit. Also derive an expression for a stability factor S. **8**

b) For a circuit show in following fig. **8**

$V_{CC} = 20V$, $R_C = 2k\Omega$, $\beta dc = 50$, $VB_{Esat} = 0.2V$, $R_1 = 100k\Omega$, $R_2 = 5k\Omega$ and $RE = 100\Omega$ calculate I_B, V_{CE}, I_C and stability factor S.



OR

10. a) Explain Bias compensation using diode and thermistor. **8**

b) What is Q-point? How does it help in determining the stability of an amplifier. Why is Q-point always preferred to be chosen as the mid point of the load line. **8**

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