1(a) what is Hall effect. Explain with applications.  
(b) Differentiate between Si and Ge diode.  
(c) Explain the working of GUNN diode.  
(d) Draw Eber’s moll model for a npn transistor and explain.  
(e) What is Slew rate? The output voltage of a certain OP-Amp ckt change by 20V in 4 µs. Find the value of its slew rate.

SECTION -A

2 (a) What is P-N junction. A sample of germanium is made of P material by adding acceptor atoms at a rate of one atom per 4* 10^8 germanium atoms. The acceptor density is assumed to be zero and ni = 2.5* 10^19 per m^3 at 300 K. there are 4.4* 10^28 germanium atom/m^3. the acceptor density is found to be 1.1* 10^20 atoms/m^3.  
(b) What is depletion layer? How it is formed in P-N junction.  
Determine the concentration of holes and electrons in N- type silicon at 300 k if the conductivity is 0.1 ohm cm^-1. Given that n_i at 300 k for silicon is 1.5* 10^10/cm^3 and μ_n at 300 k for Si is 1300 cm^2/V-S.

3(a) Draw the circuit diagram of a full wave rectifier. Explain its operation with wave form. Derive the expression for its rectification efficiency and ripple factor.  
(b) A full wave centre tape rectifier uses two semiconductor diodes each having a forward resistance of 25Ω. Value of the secondary voltage fed between centre tap to each end of secondary is 48V and load resistance (R_L), Find  
i) D.C. output voltage.  
ii) D.C. output power  
iii) Rectification efficiency  
iv) PIV

4(a) Draw and explain the working of following with V-I characteristic.  
i) DIAC  
ii) TRIC  
(b) Draw the characteristic of SCR and explain different regions of operation.

5(a) Explain the input and output characteristic of a common base amplifier. For a fixed bias circuit using a NPN transistor, the value of β is 80. If R_b = 390 kΩ, R_c = 1.5 kΩ and V_cc = 30 V. find the co-ordinates of the Q-Point.  
(b) Explain the V-I characteristic of Zener diode.

6 (a) Explain the working of N type MOSFET in details and discuss its V-I characteristic.  
(b) Explain the working of P channel JFET. An n channel JFET has a Pinch off voltage of 4.5 V and I_dss = 9mA. At what value of Vgs will I_ds be equal to 3 mA? What is its gm at this Id.

7 (a) Explain the characteristic of ideal OP-Amp. How it can be used as a summing amplifier.  
(b) Draw and explain the working of a log amplifier which provides saturation current and temperature compensation.