Dr Gagnesh Kumar 21/12/2023 (26)

National Institute of Technology Hamirpur
Department of Electronics and Communication Engineering
End Semester Examination – Dec 2023
B.Tech. (1st Semester)

Course : **Basic Electronics Engineering** Course Code : **EC-101**
Date : **21/12/2023** Duration : **9:30AM- 12:30PM**
Answer all Questions Maximum marks : **50**

Q1. State whether the following statements are true or false. Also justify your answer. (10)

a) In a PN junction diode, the depletion region width decreases with an increase in reverse bias voltage.
b) The cut-off region of a BJT is defined by both the base-emitter and base-collector junctions being reverse biased.
c) The base current in a bipolar junction transistor (BJT) is negligible compared to the collector and emitter currents.
d) JFETs (Junction Field-Effect Transistors) have a higher input impedance compared to MOSFETs (Metal-Oxide-Semiconductor Field-Effect Transistors).
e) The Early effect is primarily caused by variations in the base width of a bipolar junction transistor (BJT).

Q2.a) Determine the state of diode for the circuit shown in Figure 1 and find I_D and V_D. Assume simplified model for the diode. (5)

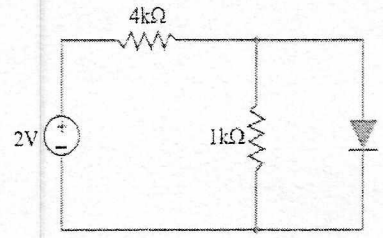

Figure 1

b) Find the voltage V_A in the circuit shown in Figure 2 (5)

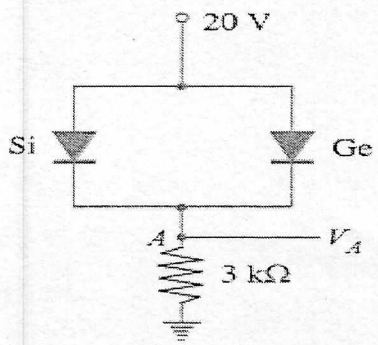

Figure 2

Q3.a) An n-p-n transistor at room temperature has its emitter disconnected. A voltage of 5 V is applied between collector and base. With collector positive, a current of 0.2 μA flows. When the base is disconnected and the same voltage is applied between collector and emitter, the current is found to be 20 μA. Find α, I_E and I_B when collector current is 1 mA. (6)

b) For the circuit shown in the Figure 3, find the power dissipated in the transistor. Assume β = 100. (4)

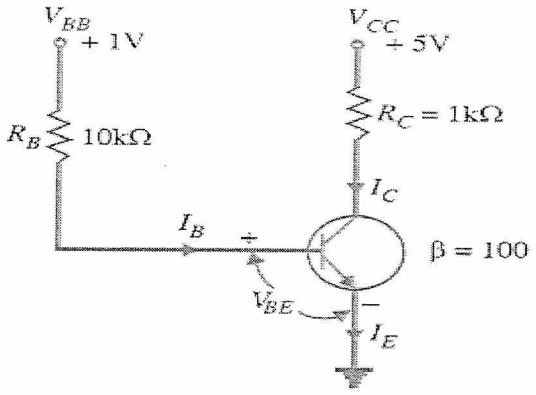

Figure 3

Q4.a) How is Emitter Bias Configuration better than Fixed Bias Configuration? Determine the expression for stability factor S for the Emitter Bias Configuration. (6)

b) For the following emitter bias network shown in Figure 4, determine I_B, I_C, V_{CE}, V_C, V_E, V_B, and V_{BC} (4)

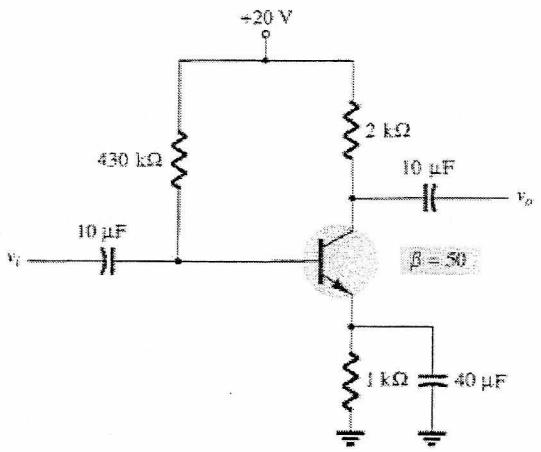

Figure 4

Q5.a) Sketch the structure of n-Channel depletion type MOSFET and explain its principle of operation with neat diagrams. Also sketch its V-I characteristics and circuit symbol. (6)

b) Compare FET and BJT (4)