I A R E

INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)
Dundigal, Hyderabad - 500 043

B TECH I SEMESTER CIE–II EXAMINATIONS, JANUARY – 2024
Regulation: BT23
ELEMENTS OF ELECTRICAL AND ELECTRONICS ENGINEERING

Time: 2 Hours

(COMMON TO CSE (AI&ML) | AE | ME | CE)   Max Marks: 20

Answer any FOUR questions
All parts of the question must be answered in one place only

1. (a) Outline the V-I characteristics of PN junction diode for forward bias and reverse bias voltages and represent the static and dynamic resistance of the diode in the characteristic curve.

   [BL: Understand| CO: 5|Marks: 2]

   (b) The reverse saturation current of a silicon PN junction diode at an operating temperature of 27^0C is 50nA. Compute the forward and reverse dynamic resistances of the diode for applied voltages of 0.8V and -0.4V respectively.

   [BL: Apply | CO: 4|Marks: 3]

2. (a) Determine the h-parameters for the common emitter configuration using NPN transistor.

   [BL: Understand| CO: 5|Marks: 2]

   (b) Given an NPN transistor for which $\alpha = 0.98$, $I_{CO} = 2\mu A$, and $I_{CEO} = 16\mu A$. A common-emitter connection is used as shown in Figure 1, with $V_{CC} = 12V$ and $R_C = 4K\Omega$. What is the minimum base current required in order for the transistor to enter into saturation region ?
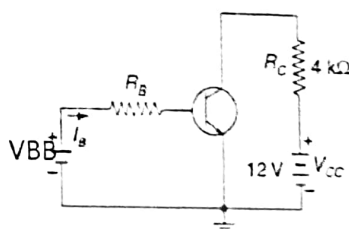
   [BL: Apply | CO: 5|Marks: 3]

Figure 1

3. (a) Illustrate the working of transistor in common collector configurations and draw its input and output characteristics.   [BL: Understand| CO: 5|Marks: 2]

   (b) A silicon transistor with $V_{BE} = 0.7V$, $\alpha = 0.98$ and collector cut-off current of $10\mu A$. Assume $R_C = 2K\Omega$, $V_{CC} = 12V$ and $I_B = 10\mu A$. solve β, I_{CE0}, I_C, I_E and V_{CE}.

   [BL: Apply | CO: 5|Marks: 3]

4. (a) Summarize CB, CE and CC amplifiers in terms of current gain, voltage gain, input impedance and output admittance.   [BL: Understand| CO: 6|Marks: 2]

   (b) In a silicon transistor circuit with a fixed bias, $V_{CC} = 12V$, $R_C = 330\Omega$, $I_B = 0.3mA$, $\beta = 100$, $V_{BE} = 0.7V$. Solve the value of bias resistor R_B and stability factor.

   [BL: Apply | CO: 6|Marks: 3]

5. (a) Construct collector to base bias using transistor and derive the expression for stability factor.

   [BL: Understand| CO: 6|Marks: 2]

(b) Determine the input impedance, output impedance, voltage gain, and current-gain for the CE amplifier of Figure 2. The h-parameters of the transistor of $h_{fe} = 60$, $h_{ie} = 500\ \Omega$ at $I_C = 3$ mA.
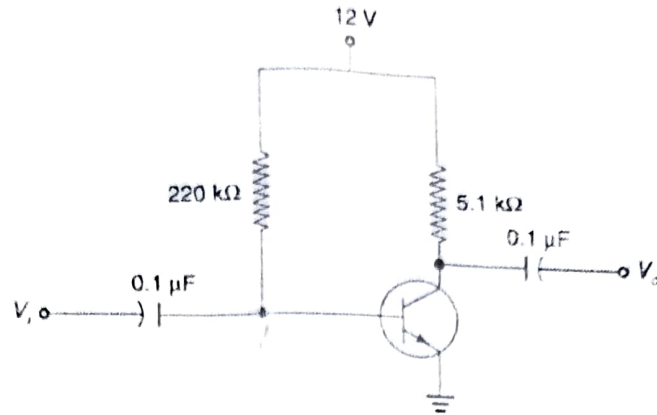
[BL: Apply | CO: 6|Marks: 3]

Figure 2