H Roll No. .....

TEC–201

B. TECH. (SECOND SEMESTER)
END SEMESTER
EXAMINATION, July/August, 2022
BASIC ELECTRONICS ENGINEERING

Time : Three Hours

Maximum Marks : 100

Note : (i) All questions are compulsory.

(ii) Answer any ***two*** sub-questions among (a), (b) and (c) in each main question.

(iii) Total marks in each main question are **twenty**.

(iv) Each sub-question carries 10 marks.

1. (a) Perform the following operations in binary : (CO1)

(i) $(15)_{10} + (12)_{10}$

(ii) $(16)_{10} - (5)_{10}$ using 1's complement

(iii) $(20)_{10} - (9)_{10}$ using 2's complement

P. T. O.

(b) State the De-Morgan's theorem of Boolean algebra. Realize EX-OR and EX-NOR gates using NAND gates only. (CO1)

(c) Simplify the following Boolean functions using the K-map : (CO1)

(i) $Y(A, B, C, D) = \Sigma m(1, 5, 6, 12, 13, 14) + d(2, 4, 10)$

(ii) $Y(A, B, C) = \Sigma m(0, 1, 2, 3, 5)$

2. (a) Distinguish between insulators, conductors and semiconductors on the basis of energy band theory. What is the difference between intrinsic and extrinsic semiconductors ? (CO2)

(b) (i) Explain the mass action law of semiconductors.

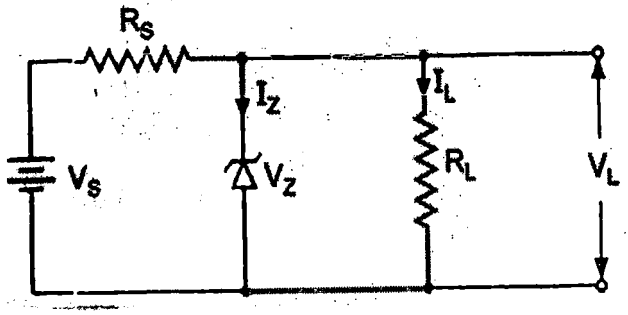
(ii) An acceptor type impurity concentration of $6 \times 10^{24}/m^3$ is added to a pure germanium semiconductor material. The intrinsic carrier concentration is $2.5 \times 10^{19}/m^3$. Determine the concentration of majority and minority carriers. (CO2)

(c) What is the difference between drift and diffusion ? Explain mathematically the drift and diffusion current density. (CO2)

3. (a) Discuss the working of a center tapped full wave rectifier. Determine its ripple factor and rectification efficiency. (CO3)

(b) Draw the circuit of bridge rectifier. Explain its working. (CO3)

(c) In the following given voltage regulator circuit, the breakdown voltage of Zener diode $V_Z = 6$ V, $R_S = 5$ kΩ, $R_L = 10$ kΩ. Determine the state of Zener diode (ON/OFF), V_L, I_L and I_Z if the applied input voltage $V_S = 15$ V. (CO3)

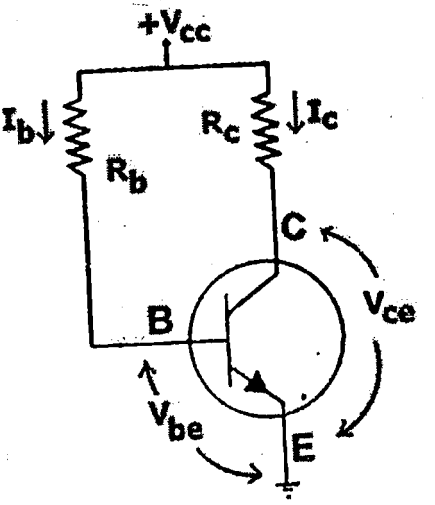


P. T. O.

4. (a) Compare CB, CE and CC configurations of a BJT. Also derive the relationship between the parameters α and β of a BJT. (CO4)

(b) Draw the input and output characteristics of BJT in CE configuration. What do you mean by the operating point ? (CO4)

(c) In the following BJT fixed bias circuit containing silicon transistor with $\beta = 100$, $V_{CC} = 6V$, $R_b = 530\ k\Omega$, $R_C = 2\ k\Omega$, determine V_{ce}, I_c and stability factor S. (CO4)



5. (a) Write the characteristics of an ideal OP-AMP. Also, explain the virtual ground concept. (CO5)

(b) Draw the circuits of OP-AMP based integrator and differentiator circuits. Also derive the expression of output for both. (CO5)

(c) (i) Derive the expression of voltage gain of OP-AMP non inverting amplifier.

(ii) In the following circuit if V_1 = 3V and V_2 = 8V, find the output voltage V_o. (CO5)