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MANIPAL INSTITUTE OF TECHNOLOGY

Manipal University, Manipal – 576 104

SECOND SEMESTER B.E. DEGREE END SEMESTER EXAMINATION

MAY-2010

SUBJECT: BASIC ELECTRONICS (ECE –101/102)

(REVISED CREDIT SYSTEM)

TIME: 3 HOURS **MAX. MARKS: 50**

Instructions to candidates

- Answer ANY FIVE full questions.
- Missing data may be suitably assumed.

1A. Explain why cut-in voltage of silicon diode is higher than the cut-in voltage of Germanium diode.

1B. Simplify the following Boolean expression and realize the function using minimum number of NAND gates.

$\bar{A}\bar{B}\bar{C}\bar{D} + A\bar{B}\bar{C}\bar{D} + \bar{A}\bar{B}\bar{C}D + \bar{A}BCD + \bar{A}B\bar{C}D + ABCD + AB\bar{C}D + A\bar{B}\bar{C}D$

1C. For a Zener network $R_s = 520\Omega$, $V_Z = 15V$, $V_i = 25 \pm 5V$. Find the minimum and maximum value of R_L so that the Zener diode remains in the ON state. $I_{Zmin} = 1mA$, $P_{ZMax} = 8W$. **(2+4+4)**

2A. Draw the load line of a self bias circuit. Also write the equation of the load line.

2B. Starting from fundamentals derive the expression for ripple factor and rectification efficiency of a full wave bridge rectifier. Also draw the circuit of the full wave bridge rectifier.

2C. Starting from fundamentals derive voltage expression for FM signal. **(2+5+3)**

3A. Draw the equivalent circuits of Ideal and Non ideal OPAMP.

3B. For the circuit shown in figure 1 determine the DC operating point. Transistor used is a silicon transistor with $V_{BE} = 0.7V$ and $\beta = 50$.

3C. For the circuits shown in figures 2 & 3 Sketch the voltages V_{o1} & V_{o2} with reference to V_i. The Diodes used in the circuits are ideal Zener diodes with break down voltages of 2V and 3V for D1 and D2 respectively. **(2+4+4)**

4A. Explain the need for modulation in communication systems.

4B. Realize each of the following equations using single OPAMP. Draw the circuit diagram, derive the input output relationship and determine the component values.

(i) $V_o = -2V_1 + 2V_2 + V_3$

(ii) $V_o = -2V_1 - 4V_2 + 7V_3$.

4C. With equations explain α_{dc}, α_{ac}, β_{dc} , β_{ac}, I_{CBO} & I_{CEO}. **(2+5+3)**

5A. For the Zener Regulator $V_i = 16V$, $R_S = R_L = 1K\Omega$, $V_Z = 12V$. Determine V_0, I_Z, P_Z. Also draw the circuit of the Zener Regulator.

5B. Indicating the direction of currents and polarity of voltages draw the input and output V-I characteristics of a PNP transistor in CE mode and explain.

5C. With equations explain drift and diffusion currents in semiconductors. **(2+5+3)**

6A. Compare Zener and Avalanche breakdown.

6B. Perform the following:

i) $(F69.D3)_{16} + (325.67)_8 = (?)_{16}$

ii) $(13.25)_{10} - (26.75)_{10} = (?)_{10}$ using Binary 2's complement arithmetic.

6C. i) For what voltage will the reverse saturation current in a p-n junction germanium diode reaches 70% of its saturation value at room temperature? Assume room temperature of 27ºC

ii) What is the ratio of current for a forward bias of 0.05 V to the current for the same magnitude of reverse bias? **(2+4+4)**

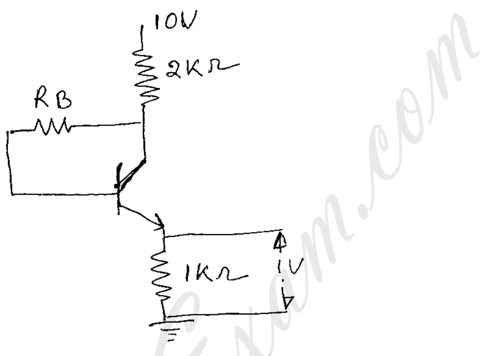

Figure 1

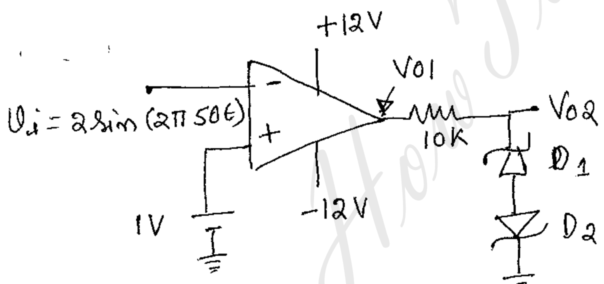

Figure 2

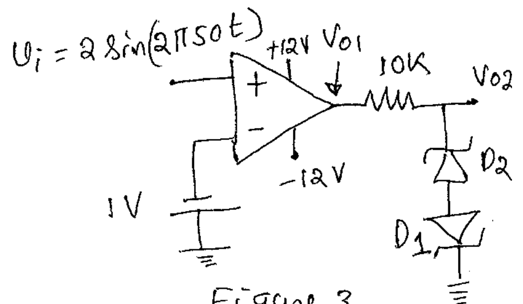

Figure 3