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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.

$$\overline{A} \overline{B} \overline{C} \overline{D} + \overline{A} \overline{B} \overline{C} D + \overline{A} \overline{B} C \overline{D} + \overline{A} \overline{B} C D + \overline{A} B \overline{C} \overline{D} + \overline{A} B \overline{C} D + \overline{A} B C \overline{D} + \overline{A} B C D$$
- 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_o , 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 27°C

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)

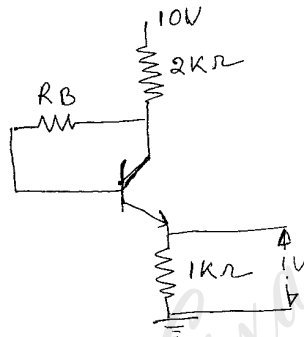


Figure 1

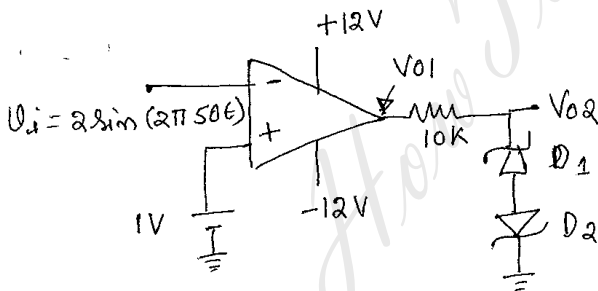


Figure 2

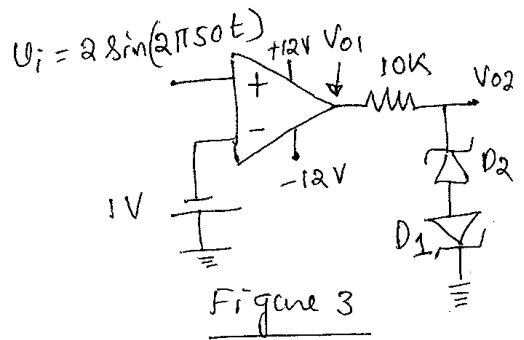


Figure 3