(b) Implement the following logic functions :

(i) $X = \overline{A} + BC$ using NAND gates only

(ii) $Y = \overline{A}B + C$ using NOR gates only

5

7. (a) Write the truth table of half-adder and full-adder. Draw their logic diagrams. 4

(b) Convert the following Boolean expression into equivalent SOP form. 3

$A\overline{B}C + \overline{A}\overline{B} + AB\overline{C}$

(c) Distinguish between multiplexer and demultiplexer. Draw the logic diagram of 4-to-1 line multiplexer. 3

8. Answer the following questions (any *two*) :

5+5

(a) Explain the temperature effects on the V-I characteristics of a diode.



(b) Derive expressions of output voltages for both inverting and non-inverting amplifier.

(c) Describe with examples the standard forms of Boolean expressions.

(d) Describe the Ideal and Real characteristics of op-amp.

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*Total number of printed pages – 7* **B. Tech**

**BE 2101 / BENG 1105**

# Second Semester Examination – 2009

## BASIC ELECTRONICS

**Full Marks – 70**

**Time : 3 Hours**

*Answer Question No. **1** which is compulsory and any **five** from the rest.*

*The figures in the right-hand margin indicate marks.*

1. Answer the following questions : 2 × 10

   (a) Explain with suitable examples the difference between analog, digital and discrete-time signals.

   (b) Compare the advantages and disadvantages between centre-tapped and bridge-type full -wave rectifier.

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(c) Define the following terms :

(i) Slew rate of an op-amp

(ii) Unity gain bandwidth

(d) Derive the expression for the collector current for a CE Transistor.

(e) Distinguish between ac and dc load line.

(f) Explain with suitable diagrams the difference between self-bias and fixed-bias.

(g) Determine the number of cycles of 1 KHz sinusoidal signal as viewed on an oscilloscope when the sweep frequencies are

(a) 2 KHz and

(b) 500 Hz.

(h) Binary number system is used in digital electronics circuits. Why octal, decimal or hexadecimal number systems are not used in circuit levels ?

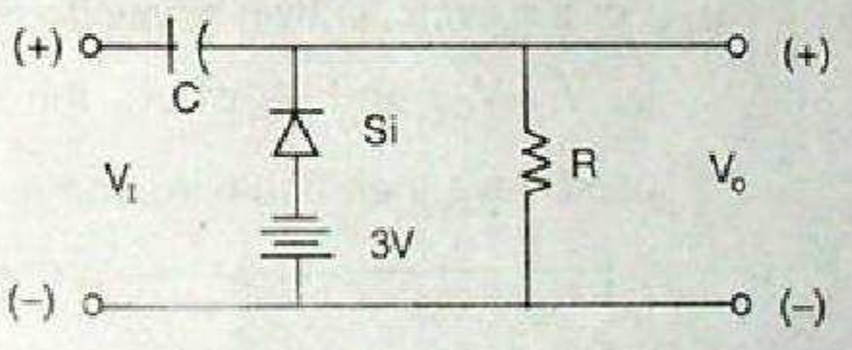
(i) Convert the decimal number – 39 to its equivalent 1's complement and 2's complement forms.



(j) Compare static - RAM and dynamic-RAM with respect to their speed, volume of data storage, size and cost.

2. (a) What is a clamper circuit ? Draw the circuit diagram of a positive clamper and a negative clamper showing their output waveforms. 5

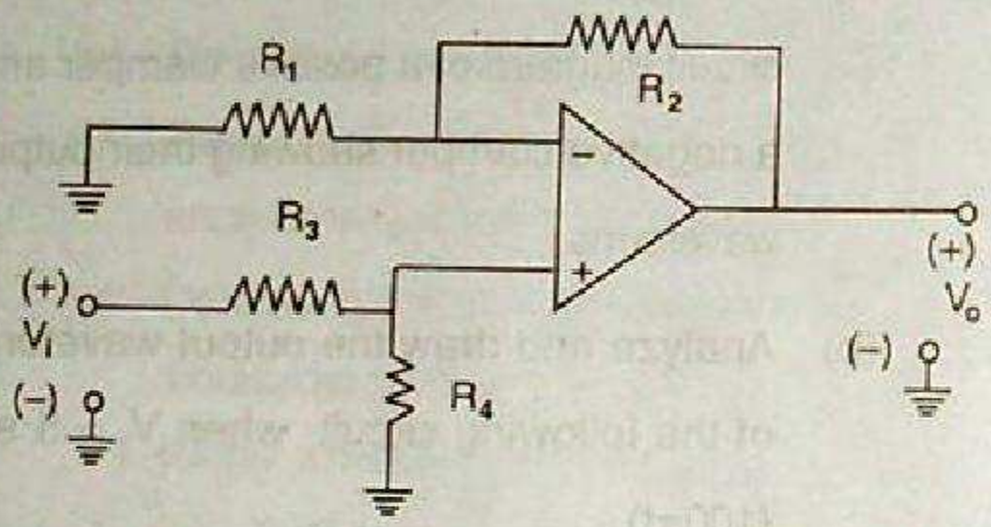
(b) Analyze and draw the output waveform of the following circuit when $V_i = 5 \sin (100\pi t)$. 5



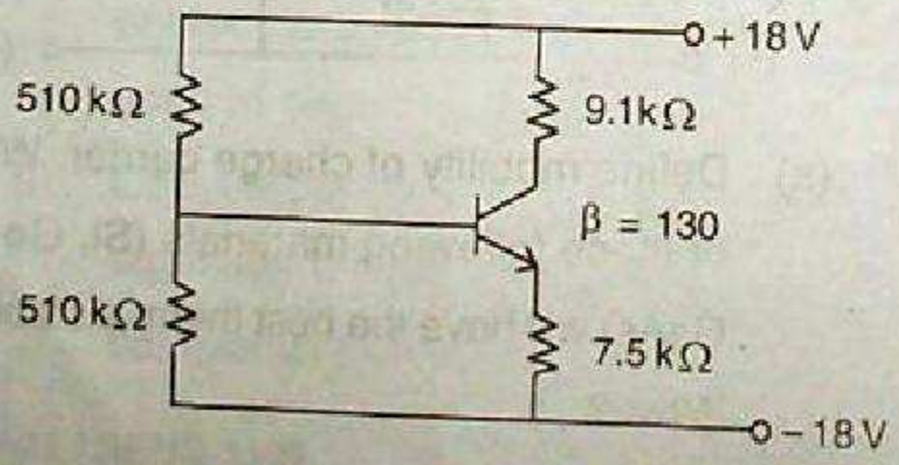

3. (a) Define mobility of charge carrier. Which of these following materials (Si, Ge and GaAs) will have the best thermal stability? Why ? 3

(b) Distinguish between zener breakdown and Avalanche breakdown. 2

(c) Derive an expression for the voltage gain of the given op-amp circuit. 5




4. (a) For the circuit shown below determine $I_B$, $I_C$, $V_E$, $V_{CE}$ and $V_B$ where the symbols used have their usual meaning. 5






(b) Draw a simplified hybrid model of CE transistor amplifier and then find its input impedance, output impedance and voltage gain. 5

5. (a) Explain the basic principle of sinusoidal oscillator. How does an oscillator start its operation ? What is its voltage gain during starting and during its normal operation ? 5

(b) State and explain the function of the sweep signal in an oscilloscope. What is Lissajous method ? Does Lissajous method require sweep signal ? Justify answers in brief along with suitable diagram or graphs. 5

6. (a) Which logical gates are considered as Universal gates ? Draw the circuit diagrams showing the universal properties of any *one* Universal gate. 5