(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 3301   Roll No.

B. Tech.

(Only for the candidates admitted/Readmitted in the session 2008-09)

(SEM. I) EXAMINATION, 2008-09
ELECTRONICS ENGINEERING

Time : 3 Hours]   *[Total Marks : 100*

Note :   *Attempt all questions.*

SECTION - A

1   Attempt all the parts of this question. All parts of   **2×10=20**
the question carry equal marks. This question contains
10 objectives / Fill in the blank type / True False
type questions :

(i)   In Avalanche multiplication, pickup the correct
answer :

(a)   Disruption of covalent bond occur by collision

(b)   Direct rupture of bonds

(c)   (a) and (b) both

(d)   None of the above

Pickup the correct answer :

(ii)   Which one of the following has the ability to act
as an open circuit for dc and a short circuit for
ac of high frequency ?

(a)   An inductor

(b)   A capacitor

(c)   A resistor

(d)   None of the above.

(iii) The alpha (α) and beta (β) of a transistor are related to each other as

(a) $\alpha = \dfrac{\beta}{\beta + 1}$

(b) $\beta = \dfrac{\alpha}{1 + a}$

(c) $\beta = \dfrac{1 + \alpha}{\alpha}$

(d) $\alpha = \dfrac{1 + \beta}{\beta}$

(iv) Read the following statement

(a) I_{co} in a transistor consists of **True/False** majority carriers.

(b) Bias stabilization is used to prevent **True/False** thermal run away.

(v) An n type channel FET is superior to p type channel FET because _____ of electrons is greater than that of holes.

(vi) Which one of the following has the highest input resistance ?

(a) npn transistor in CB configuration

(b) pnp transistor in CE configuration

(c) n type channel JFET

(d) p type channel MOSFET

(vii) For the circuit shown in Fig. 1, the output voltage V_0 is given by :

▊▊▊▊▊▊▊▊▊▊ 2

(a) $V_0 = -\dfrac{1}{RC}\displaystyle\int_0^t V_i(t)\,dt$

(b) $V_0 = -RC\displaystyle\int_0^t V_i(t)\,dt$

(c) $V_0 = -RC\,\dfrac{d}{dt}V_i(t)$

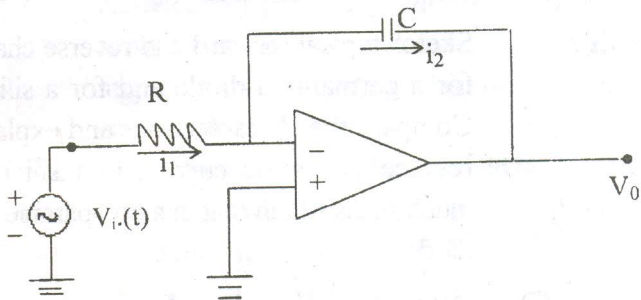(d) $V_0 = -\dfrac{1}{RC}\,\dfrac{d}{dt}V_i(t)$

Fig. 1

(viii) The boolean expression

$Y = AB + (A + B)(\bar{A} + B)$. may be simplified as

(a) $Y = A$

(b) $Y = \bar{A}$

(c) $Y = B$

(de) $Y = \bar{B}$

(ix) The time base of an oscilloscope is developed by

(a) A sine wave voltage

(b) A square wave voltage

(c) A sawtooth voltage

(d) The pulse from a built in clock.

(x)   "If we give negative potential to the upper vertical deflection plate with respect to the lower one of the CRT, the spot on the screen moves upward". The above statement is

(a)   True (b) False.

SECTION - B

Note :   *Attempt any **three** parts of the following.*   10×3=30

2   (a)   (i)   Sketch typical forward and reverse characteristics for a germanium diode and for a silicon diode. Compare the characteristics and explain why the reverse saturation current in a silicon diode is much smaller than that in a comparable germanium diode.

(ii)   Determine V_0, I_1, I_{D_1} and I_{D_2} for the parallel diode configuration of **Fig. 2**.
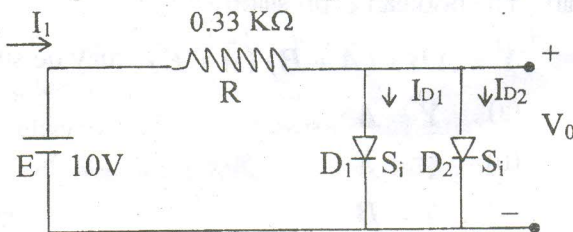

Fig. 2

(b)   (i)   Explain why in the active operation, the base current I_B is much smaller than I_C or I_E. What is the relation among the three currents ?

(ii)   Define α and β with respect to BJT and derive the relationship between them.

(c) (i) How is an FET used as a voltage variable resistor ? Explain.

(ii) What are the characteristics of an ideal operational amplifier ? Explain an inverting amplifier.

(d) (i) State and prove De Morgan's theorem. How is it helpful in minimizing a given Boolean expressions ?

(ii) What is Karnaugh map ? Explain how it helps in simplifying a given Boolean expression. Draw Karnaugh map for three number of variables. Also show alternative schemes for drawing a Karnaugh map for three variables, when diagonal mapping is done in K maps.

(e) Sketch a Cathode Ray Tube used in a CRO. What are its main parts ? Give the functions of each part. How is current measured by CRO ?

SECTION - C

Note : *Attempt **all** the questions. All questions carry **equal** marks.*   10×5=50

3 Attempt any **two** parts of the following :

(a) Discuss the different types of junction break down that can occur in a reverse biased diode. Explain the shape of the break down diode charcteristics. What will be their thermal coefficient ?

(b) Draw circuit diagrams to show two methods of producing a negative output votlage from a half wave rectifier. Explain briefly the circuit operations.

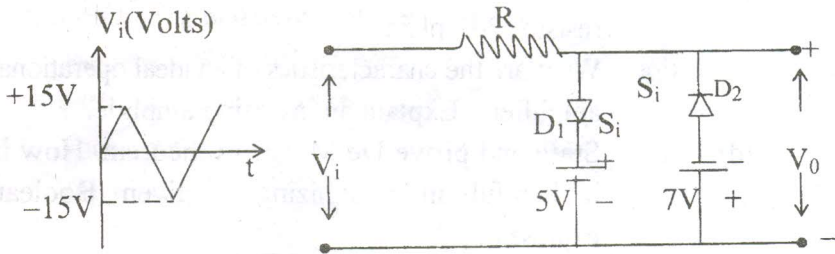(c) What is clipper circuit ? Sketch the output votlage wave form for the circuit shown in **Fig. 3**.

Fig. 3

4 Attempt any **one** part of the following :

   (a) Sketch a votlage divider bias circuit using an npn transistor. Show all voltage polarities and current directions. Explain the operation of the circuit and write the approximate equations for V_B, I_E, I_C and V_{CE}.

   (b) For a CE amplifier circuit with h-parameters

   $h_{ie} = 2\ k\Omega$, $h_{re} = 6 \times 10^{-4}$

   $h_{fe} = 50$, $h_{oe} = 25\mu\ A/V$ and

   Load resisitance $R_L = 4\ k\Omega$,

   Source resistance $R_s = 10\ k\ \Omega$.

   Compute A_v, A_L, R_i and R_o.

5 Attempt any **one** part of the following : 10×1=10

   (a) Sketch the structure of a p type channel depletion type MOSFET and explain its principle of operation with neat diagrams. Also sketch its V-I characteristics and circuit symbols for it.

(b) (i) Define and explain the terms common mode rejection ratio and virtual ground in an OP-amp. Why integrators are preferred over differentiators.

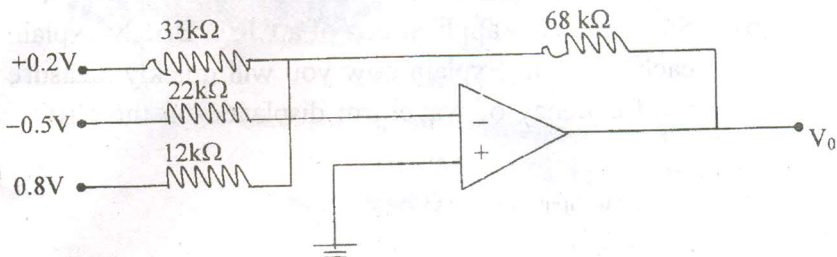(ii) Find the output voltage of the following op-amp. Circuit shown in **Fig. 4**.

Fig. 4

6   Attempt any **two** parts of the following :

(a) (i) Add and subtract with converting the following two hexadecimal numbers A4FB and 3FDC

(ii) Convert the following numbers as indicated

(I) $(6089.25)_{10}$ = (_____)$_8$

(II) $(A6BF.5)_{16}$ = (_____)$_2$

(III) $(25.26)_8$ = (_____)$_2$

(b) (i) What is/are Universal gate(s) implement two input XOR gate using only 4 NAND gates.

(ii) Express the Boolean function

$F = AB + AC + A\bar{D}$ in a sum of minterms form.

(c) Minimize the given Boolean function using K-map and implement the simplified function using NOR gates only

$F(w, x, y, z) = \sum m (0, 1, 2, 9, 11, 15) + d(8, 10, 14)$

7 Attempt any **one** part of the following : 10×1=10

(a) Explain briefly the working principle of a digital multimeter with the aid of a block diagram. What are the characteristics of Digital Voltmeter used in a typical digital multimeter ?

(b) State the main applications of a CRO. Briefly explain each of them. Explain how you will quickly measure the frequency of waveform displayed on the CRO.