

Total number of printed pages – 8

B. Tech

BENG1105/BE2101

First Semester Examination – 2008

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.

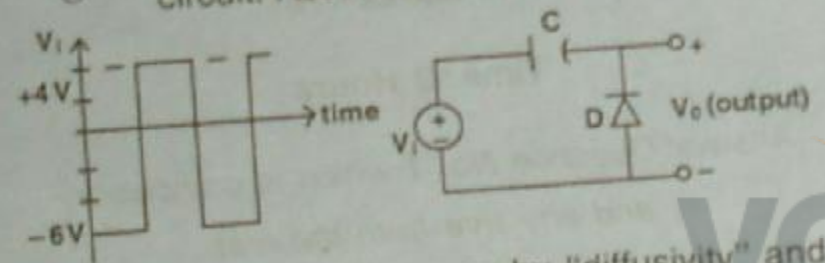
1. Answer the following questions : 2×10
- (a) An amplifier has a voltage gain of $100V/V$
and current gain of $1000 A/A$. Express
the voltage and current gains in decibels
and find power gain.
- (b) Define 'stability factor' and derive its
general expression.

P.T.O.

(c) Prove that $A + \bar{A}B = A + B$.

(d) Add the following binary unsigned numbers 0110 1010, 0000 1000, 1000 0001 and 1111 1111.

(e) Draw the output waveform of the following circuit. Assume silicon diode.



(f) What do you mean by "diffusivity" and "mobility" of holes?

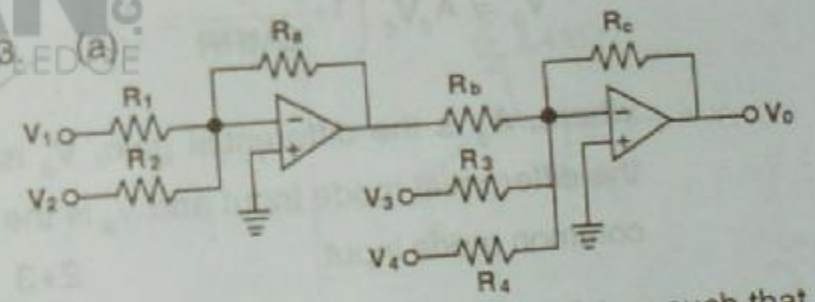
(g) Define "Overdrive Factor" and write its significance.

(h) Draw the output characteristic of CE configuration showing different operating regions along with necessary conditions.

(i) What are the functions of sweep trigger and sweep generator in CRO?

(j) State the differences between a static RAM and dynamic RAM.

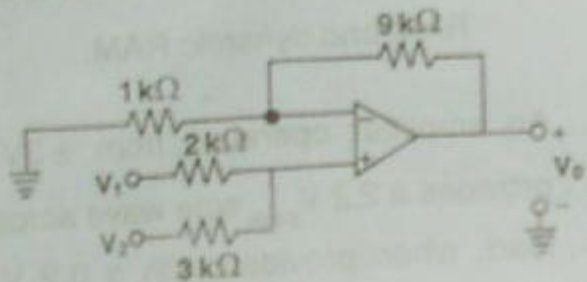
2. An amplifier operating from $\pm 3V$ supplies provides a $2.2 V_{peak}$ sine wave across a 100Ω load, when provided with a $0.2 V_{peak}$ input from which $1.0 mA_{peak}$ is drawn. The average current in each supply is measured to be $20 mA$. Find the voltage gain, current gain and power gain expressed as ratios and in dB as well as the supply power, amplifier dissipation and amplifier efficiency.



Find the values of the resistors such that the circuit above provides

$$V_o = 2V_1 + V_2 - 4V_3$$

Or



Find the value of V_0 .

- (b) What do you mean by CMRR and slew rate? Also derive the following expression:

$$V_0 = A_d V_d \left(1 + \frac{1}{\text{CMRR}} \times \frac{V_c}{V_d} \right)$$

where, A_d is the differential gain, V_d is the differential mode input and V_c is the common mode input.

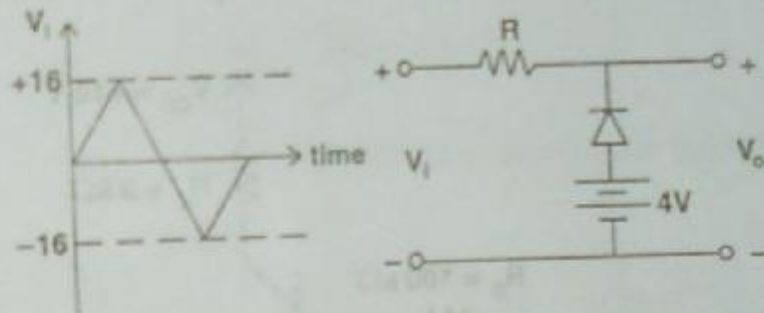
4. (a) Derive an expression for I_{dc} and I_{rms} for half-wave rectifier circuit and find its maximum efficiency.

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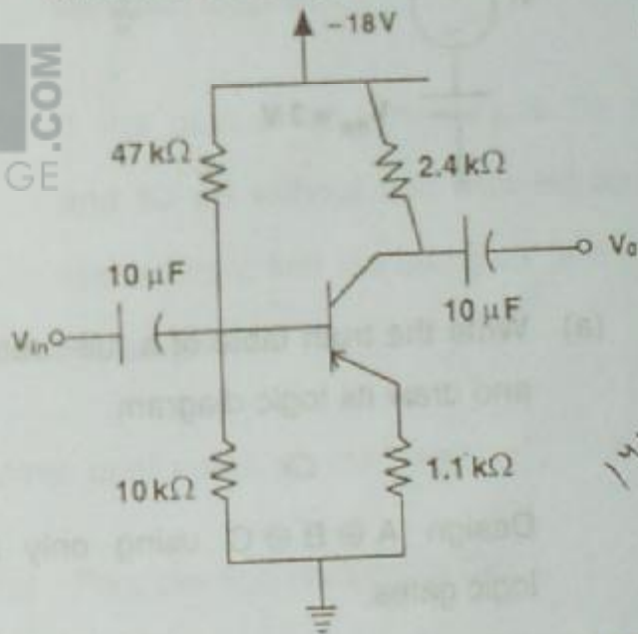
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Contd.

- (b) Determine the expression of V_0 for the following network and draw its output waveform. Assume silicon diode.



5. (a) Determine V_{CE} for the following voltage divider bias configuration. Take $\beta = 120$.



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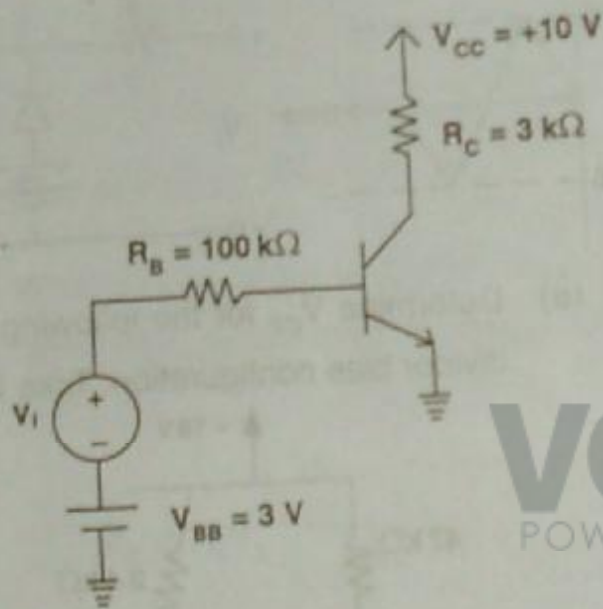
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P.T.O.

Handwritten notes: $I_{dc} = \frac{V_m}{2}$ and $I_{rms} = \frac{I_m}{\sqrt{2}}$

Handwritten number: 141.34

- (b) Determine the voltage gain of the following circuit. Assume $\beta = 100$. 5



6. (a) Write the truth table of a full-subtractor and draw its logic diagram. 5

Or

Design $A \oplus B \oplus C$ using only basic logic gates.

- (b) Simplify the following Boolean expression : 3

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

- (c) Design EX-OR gate using only NAND gates. 2

7. (a) Explain the principle of Crystal Oscillator with neat diagram. 5

- (b) If the gain of an amplifier is 90 dB and 60 dB without and with feedback respectively, find the feedback factor of the amplifier. 5

8. Write brief notes on any two : 5×2

- (a) Principle and working of CRO

(b) Circuit diagram and truth table of the following Flip Flops :

S-R, J-K, Master Slave, D

(c) Formation of depletion layer in semiconductor diode and effect of biasing on it.

