(8)

Total number of printed pages = 4

B. Tech

EENG 1105

Second Semester Examination — 2007

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) What is the significance of virtual ground of an OP-AMP ?

   (b) Distinguish Avalanche and Zener break-down.

   (c) (i) Convert $(30.3)_{10}$ to equivalent binary number.

   (ii) What is the decimal equivalent of hexadecimal number $(BAD)_{16}$?

P.T.O.

(c) Why is the field effect transistor called a unipolar transistor ? What is the significance of the term field-effect ?

(d) A BJT is a current controlled device whereas a FET is a voltage controlled device. Why ?

(e) If FA53 Hex is the input to the inverter, what will be the inverted output of inverter in Hex and binary ?

(f) If $A\overline{B} + \overline{A}B = C$ then show that $A\overline{C} + \overline{A}C = B$

(g) Define mobility and conductivity.

(h) Mention few three applications of an OP-AMP.

(i) What are the industrial applications of a counter ?

(j) How can a wave-form displayed in a CRO ?

2. (a) Explain the following terms: Fan out, Noise margin, and propagation delay of logic gates. 3

(b) Explain and draw the circuit of a full adder. 7

3. (a) Discuss how a transistor can be used as a current amplifier ? 4

(b) Sketch the structure of an n-channel depletion type of MOSFET. Explain how the depletion region is produced in the channel ? 6

4. Consider the voltage-amplifier circuit model shown in the fig.1 given in $A_{vo} = 10$ v/v under the following conditions : 10

(a) $R_i = 10R_s$, $R_L = 10R_o$

(b) $R_i = R_s$, $R_L = R_o$

(c) $R_i = R_s / 10$, $R_L = R_o / 10$

Calculate the overall voltage gain v_o / v_s in each case, expressed both directly and in dB.

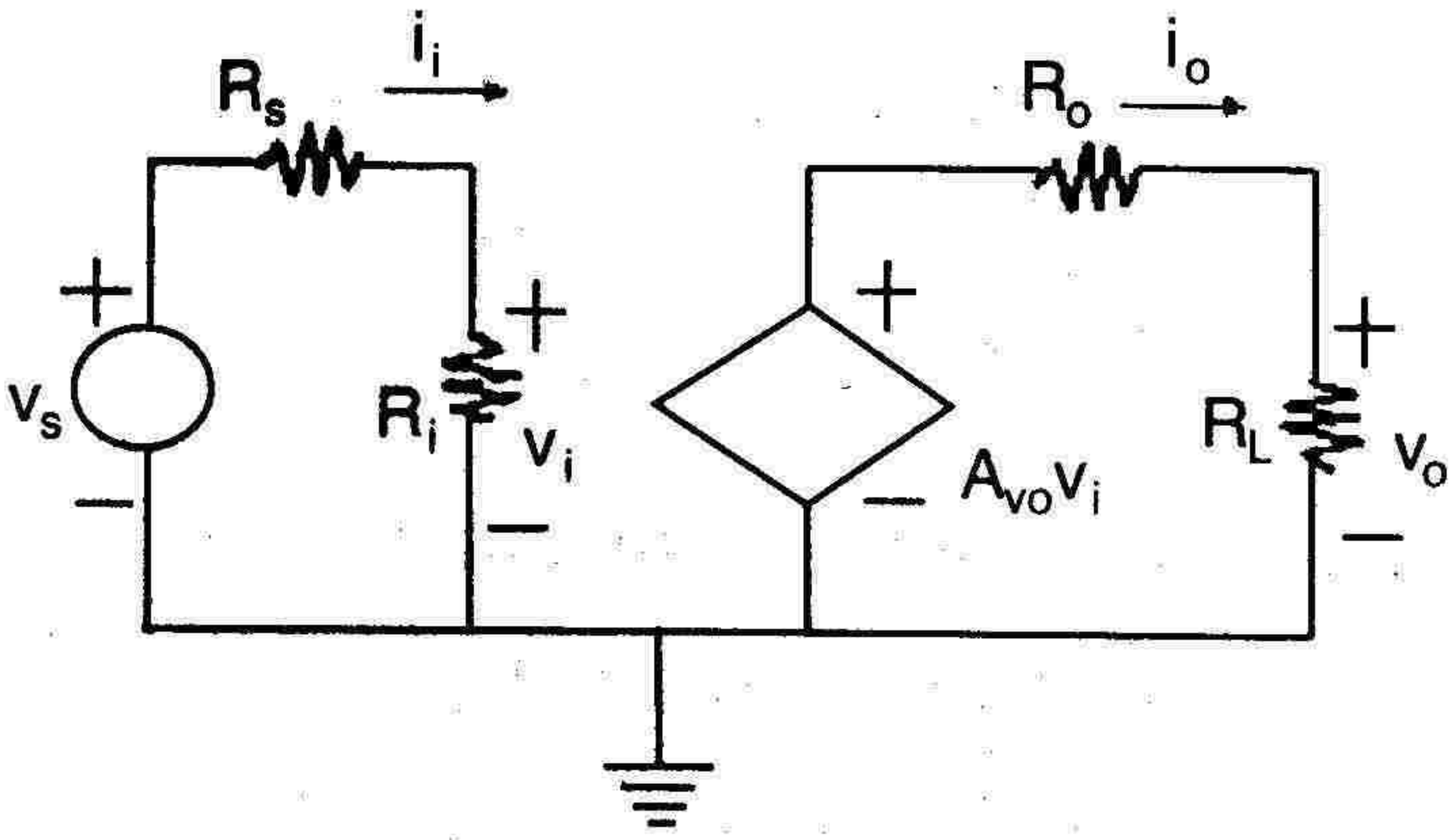

Figure – 1

5. A particular diode, for which n = 1, is found to conduct 3mA with a junction voltage of 0.7 volt.

   (a) What is saturation current I_s ?

   (b) What current will flow in this diode if the junction voltage is raised to

      (i) 0.71V (ii) 0.8V ?

   (c) What current will flow in this diode if the junction voltage is lowered to

      (i) 0.69V (ii) 0.6V ?

(d) What change in junction voltage will increase the diode current by a factor of 10 ? 10

6. Consider the half-wave rectifier circuit of the fig. 2 shown below with R = 1 KΩ and the diode having the characteristics and piece-wise-linear shown in the fig. 3 (V_{Do} = 0.65V, r_D = 20 Ω). Analyse the rectfier circuit using the piecewise-linear model for the diode and thus find the output voltage v_o as a function of v_I, for $0 \leq v_I \leq 10V$. For v_I being sinusoidal with 10V peak , sketch and clearly lebel the wave-form v_o. 10

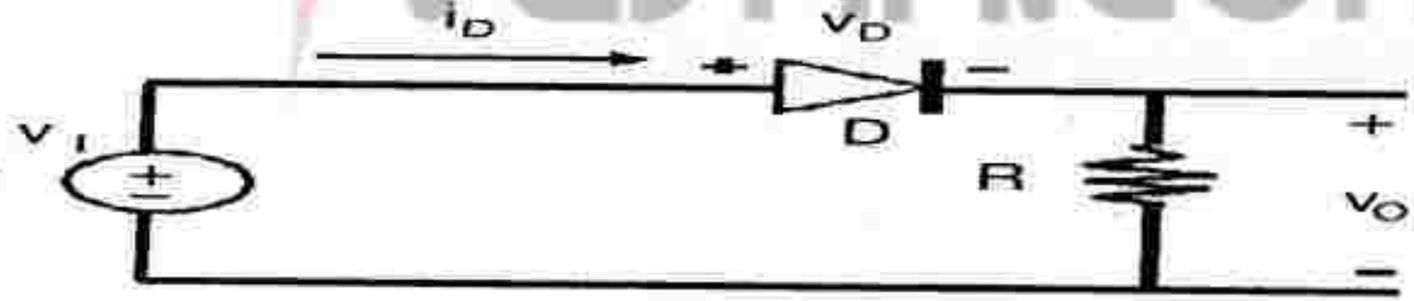

Figure — 2

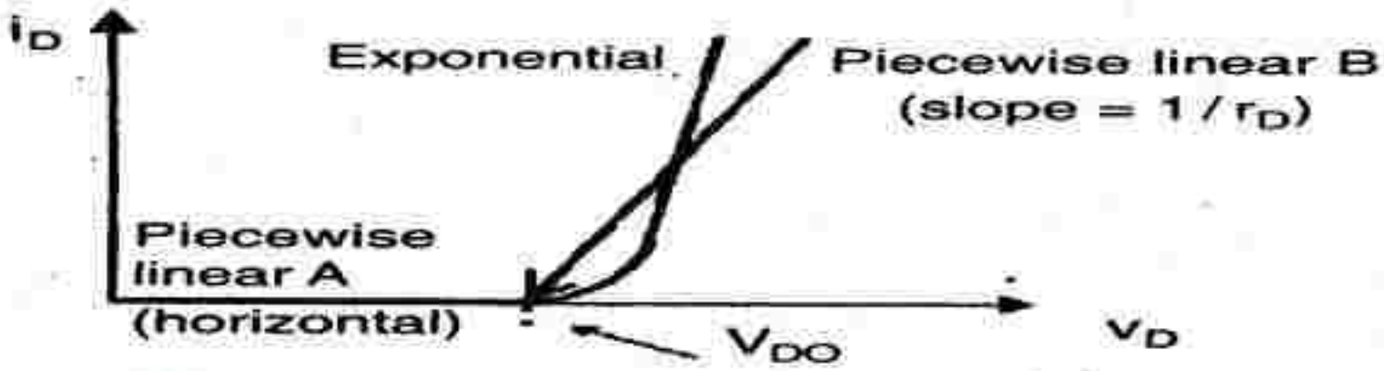

Figure — 3

7. Design the self-biasing circuit for transistor to meet the following specifications. 10

$I_C = 2$ mA, Voltage gain $= -100$, $R_L = 5\ k\Omega$

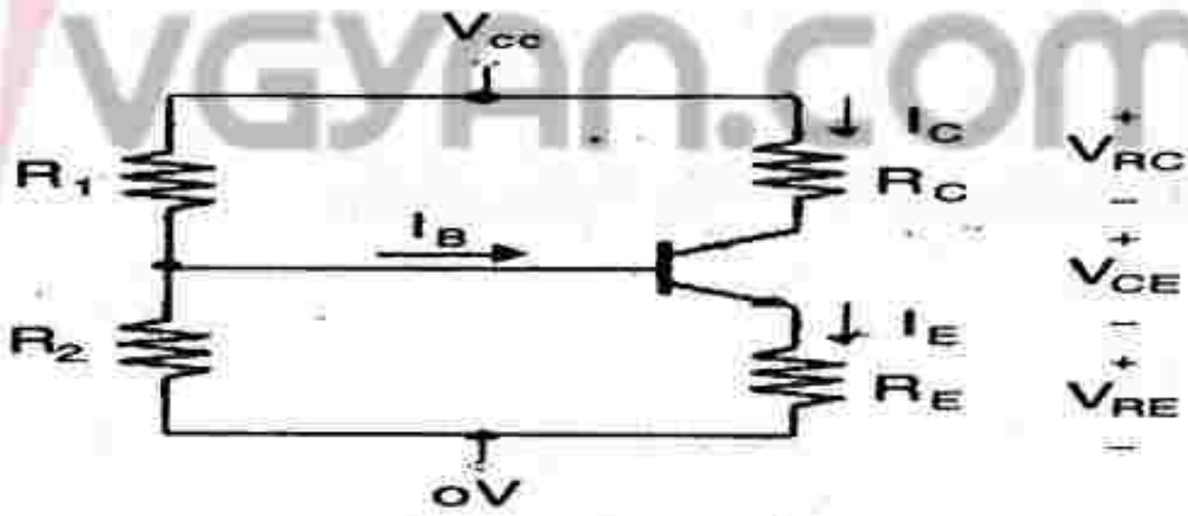

Figure — 4

8. (a) The peak-to-peak value of an AM voltage has a maximum value of 8V and a minimum value of 2 V. What is the percentage of modulation and amplitude of the unmodulated carrier ? 6

(b) Distinguish between frequency and amplitude modulation. 4