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Registration No. : | | | | | | | | | | |

Total number of printed pages – 4

B.Tech
BE 2101

Second Semester Examination – 2012

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 the difference between analog, digital and discrete-time signal.

   (b) What is meaning of CMRR of an OPAMP ? How it affects the performance of the OPAMP ?

   (c) Compare the advantages and disadvantages of center-tapped and bridge type full wave rectifiers.

   (d) An amplifier has an open loop gain of 1000 and a feedback ratio of 0.04. If the open loop gain changes by 10% due to temperature, find the %change in gain of the amplifier with feedback.

   (e) Derive the expression for collector current for a CE transistor.

   (f) 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.

   (g) A Periodic digital waveform has pulse width of 25 μS and a period of 150 μS. Determine the frequency and duty cycle.

   (h) Convert $(0.65625)_{10}$ and $(10.625)_{10}$ to equivalent base 2 numbers by repeated division-by-2 or multiplication-by-2 methods.

   (i) Distinguish between Multiplexer and Demultiplexer and mention one application of each.

P.T.O.

(j) Simplify the following Boolean expressions :

(i) $Y = 1 + A(B.\overline{C} + B.C + \overline{B}.\overline{C}) + A\overline{B}C + AC$

(ii) $Y = \overline{(A + \overline{B} + C) + B + \overline{C}}$

2. A crystal diode having an internal resistance $r_f = 10\ \Omega$ is used for center tapped full wave rectification. If the applied voltage is $V = 50 \sin(\pi t)$ and the load resistance is $R_L = 1\ k\Omega$, determine the followings :

(a) Draw the input and output voltage and current waveforms. 4

(b) The efficiency of the circuit. 3

(c) The Ripple factor. 3

3. (a) What is a clipper circuit ? Explain with an example. 4

(b) Analyze and draw the output waveform of the circuit shown in Figure Q3 when $V_i = 5 \sin(100\ \pi t)$. 6

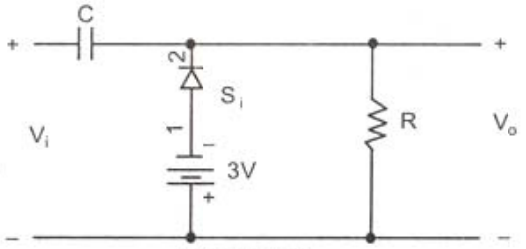

Figure Q3

4. (a) Describe the use of an opamp as a Differentiator and derive the expression of the output voltage. 5

(b) Draw and scale the output waveform V_O of the circuit shown in the Figure Q4 below for the input waveform V_S as shown in the Figure. 5

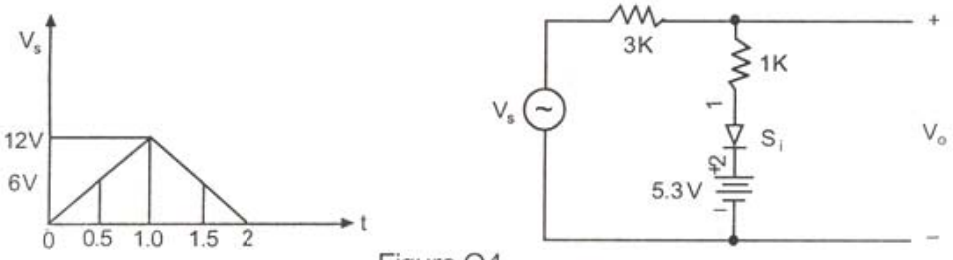

Figure Q4

5. (a) Find I_{CQ} and V_{CEQ} of the circuit shown in Figure Q5 (a) below when $R_1 = 10\ k\Omega$. 5

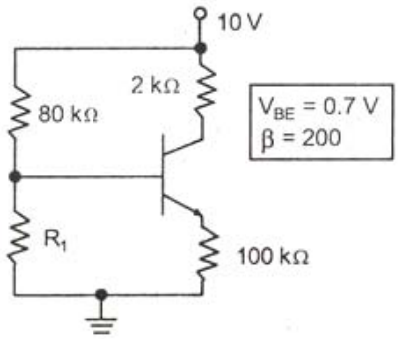

Figure Q5(a)

(b) Find V_{CC}, R_B, and R_E in the circuit shown in Figure Q5(b) above using the dc load line given. Assume $\alpha \approx 1$. 5

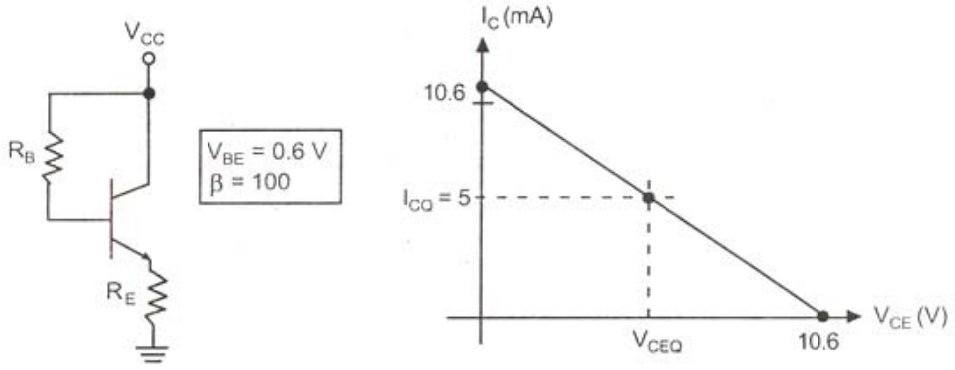

Figure Q5(b)

6. (a) Draw AC equivalent circuit of a CC amplifier using h-parameter and then find voltage gain, current gain, output and input impedances. 5

(b) Find the bias point and AC amplifier parameters of the circuit shown in Figure Q6. The Manufacturers' specification sheets give : $h_{fe} = 200$, $h_{ie} = 5\ \Omega W$, $h_{oe} = 10\ \mu Moh$. 5

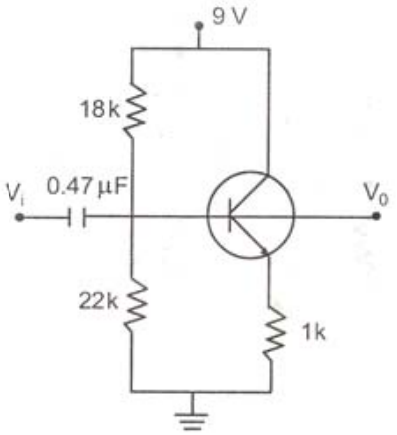

Figure Q6

7. (a) Write the truth table of half adder and full adder and draw their logic diagrams ? 5

(b) Implement the full adder using two half adders and an OR gate. 2

(c) Draw the block diagram of a 4 bit adder. 3

8. (a) Explain the operation of a gated S-R latch with suitable sketches. 4

(b) Implement the following Boolean functions with a multiplexer : 6

(i) $f(A, B, C, D) = \sum (0, 1, 3, 4, 8, 9, 15)$

(ii) $f(A, B, C, D) = \sum (1, 3, 4, 11, 12, 13, 14, 15)$