

Second Semester Examination – 2010

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) A signal is represented by $y = 5\sin(628t +$

P.T.O.

30°). Find the frequency, amplitude and initial phase of the signal.

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

(d) Why voltage series feedback is most commonly used in amplifiers?

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

(f) Write down the advantages of a negative feedback amplifier.

(g) Define the term h_{ie} , h_{ie} , h_{oe} and h_{re} of a transistor.

(h) What is the relationship between the period of a waveform and its frequency?

(i) What do you mean by digital waveforms and explain rise time, fall time and pulse width by drawing the pulse characteristics?

(j) What do you mean by 3 state gate, what is its importance in combinational circuit?

2. A crystal diode having an internal resistance $r_i = 10 \Omega$ 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) Write ideal characteristics of an opamp.

4

(b) Draw circuits for both inverting and non-inverting amplifiers using opamp. Derive an expression for the gain of an inverting amplifier.

6

4. (a) A negative feedback amplifier has open loop gain 10^5 and closed loop gain 100.

(i) Determine feed back factor. 2

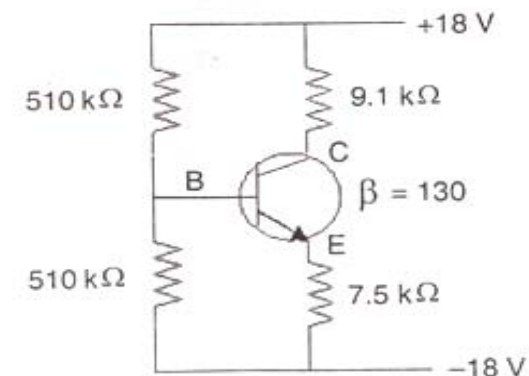
(ii) If a manufacturing error results in a reduction of open – loop gain to 103, what closed-loop gains results ? 2

(iii) What is the percent change in closed-loop gain corresponding to this change in open loop gain ? 1

(b) Explain the Bandwidth Extension and Reduction in Non-linear distortion properties of negative feedback amplifier. 5

5. (a) Explain the difference between Voltage divider bias and Self bias circuits. 2.5

(b) For the circuit shown below, determine I_B , I_{CQ} , V_E , V_{CEQ} and V_B where symbols denote their usual meaning. 1.5×5



6. (a) State and explain the function of the sweep generator in an Oscilloscope. 6

- (b) Explain how phase measurement can be done using an Oscilloscope through the Lissajous method. 4

7. (a) State the Associative and Commutative laws of Boolean algebra. 2

- (b) State De-Morgan's theorem and apply it to the following expression : 3

$$Y = \overline{AB + \overline{CD} + EF}$$

- (c) Using Boolean algebra technique, simplify the following expressions : 2.5x2

(i) $AB + A(B + C) + B(B + C)$

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

8. (a) Apply De-Morgan's theorems to minimize the expressions : 6

(i) \overline{WXYZ} and $\overline{W + X + Y + Z}$

(ii) $\overline{\overline{WXYZ}}$

(iii) $\overline{A + B + \overline{C} + D(E + \overline{F})}$

- (b) Determine the binary values for which the following POS expression is equal to 0. 4

$$(X + \overline{Y} + Z)(\overline{X} + Y + Z)(X + Y + \overline{Z})(\overline{X} + \overline{Y} + \overline{Z})(X + \overline{Y} + \overline{Z})$$
