(Set-P)

B. Tech-2nd

Basic Electronics

Full Marks : 70

Time : 3 hours

Answer six questions including Q. No. 1 which is compulsory

The figures in the right-hand margin indicate marks

Symbols carry usual meaning

1. Answer *all* questions : 2×10

(*a*) What is the significance of virtual ground of an OPAMP ?

(*b*) Differentiate between analog, digital and discrete signal with suitable diagram.

(*c*) What is the range of *n* bit signed binary number ?

(*d*) Consider a 4 bit digital word $D = b_3 b_2 b_1 b_0$ used to represent an analog signal V_A that varies between 0 V and +15 V. Find the values of D correponding to $V_A = 0$ V, 1 V, 2 V and +15 V.

(Turn Over)

(e) What is biasing? What should be the condition for proper biasing?

(f) What is slew rate of an operational amplifier? What is its significance?

(g) Realise an EX-OR gate using NOR gate.

(h) What is time base voltage? Why the time base voltage is generally given to *X* plate of a CRO?

(i) Perform the following operation and express the answer in octal form:

$$(336)_8 - (737)_8 + (775)_{16}$$

(j) Differentiate between AM and FM.

2. (a) Draw the circuit diagram of the bridge type full-wave rectifier and explain how it works. 5

(b) Derive the relationship between Alpha (α), Bita(β) and Gama(γ). In a PNP transistor operating in the active region, the emitter current $I_E = 8$ mA and alpha (α) = 0·95. Compare the collector current I_C and base current I_B Neglect I_{CO}. 5

3. (*a*) Explain the working of an OPAMP based integrator circuit ? Also draw the output wave form when 4 V peak to peak square wave voltage is applied. 5

(*b*) Define I_{CBO} and I_{CEO}. Derive an expression to find the relation among them. 5

4. (*a*) Find the values of the valued variables *A*, *B*, *C*, and *D* by solving the set of simultaneous equations

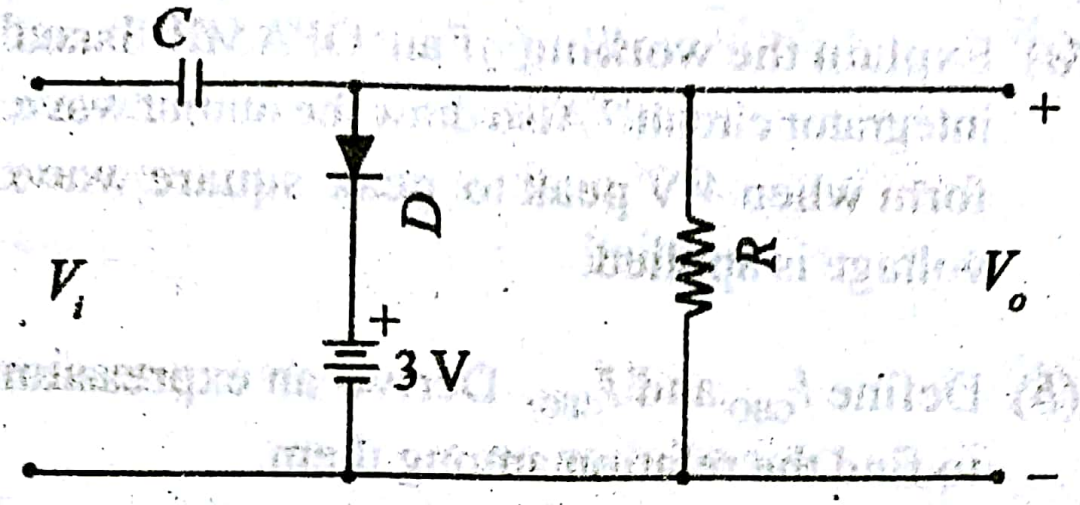
$AA' + AB = 0$, $AB = AC$ and $AB + AC' + CD = C'D$ 5

(*b*) Prove the following using Laws of Boolean Algebra : 5

(*i*) $AB'C + A'BC + ABC = C(A + B)$

(*ii*) $AB'(C + BD) + A'B' = B'C + A'B'$

5. (*a*) Draw output waveform V_0 for the biased clamping circuit shown in Figure given below. Assume $V_i = 5$ V square wave. What happens to the output waveform when the diode is reversed ? 5



(*b*) Distinguished between positive and negative feedback. The open loop gain of an amplifier changes by 10 percent. If 5 dB negative feedback is applied, calculate the percentage change in the closed loop gain. 5

6. (*a*) What do you meant by race around condition ? Explain the working of J-K Flip-Flop. 5

(*b*) Explain Diode as voltage regulator. 5

7. (*a*) With appropriate block diagram, explain the principle operation of AM receiver. 5

(*b*) Explain the block diagram of CRO. 5

8. Write short notes on the following : 5 + 5

(*i*) Electronic Multimeter

(*ii*) RC High pass filter.