

B.Tech-1st

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 time base voltage ? Why the time base voltage is generally given to X plate of a CRO ?

(b) 2's complement representation of a 16 bit number (one sign bit and 15 magnitude bits) is FFFF. Represent its magnitude in decimal.

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

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

(Turn Over)

- (e) What are the tools used to draw the spectrum of a signal ? Draw the spectrum of a sinusoidal periodic signal of period T .
- (f) Is JFET is more advantageous than the BJT ? Justify.
- (g) Realise an EX-OR gate using NOR gate.
- (h) What is slew rate of an operational amplifier ? What is its significance ?
- (i) Convert $(0.275)_{10}$ into its binary equivalent and $(1001001)_2$ into its decimal equivalent No.
- (j) What is the range of signed decimal numbers that can be represented by 6 bit 1's complement form ?
2. (a) With a neat sketch, compare RC low-pass circuit with RC high-pass circuit. 5
- (b) Draw the circuit diagram of the bridge type full-wave rectifier and explain how it works. 5
3. (a) Define I_{CBO} and I_{CEO} . Derive an expression to find the relation among them. 5

(b) With the help of a diagram, describe the basic structure of an n channel junction FET. Give the biasing arrangement. 5

4. (a) With neat diagram, explain the principle of operation of a CRO. Mention two application of it. 5

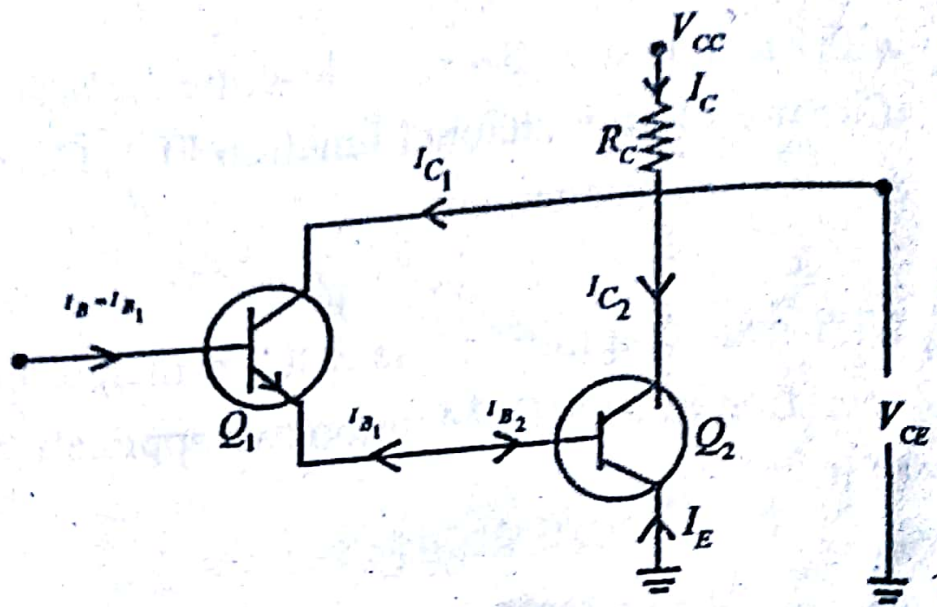
(b) The four variable function ' f ' is given in terms of min-terms as

$$f(A, B, C, D) = \sum m(2, 3, 8, 10, 11, 12, 14, 15).$$

Convert this function in the sum of products (SOP) form and minimize it. 5

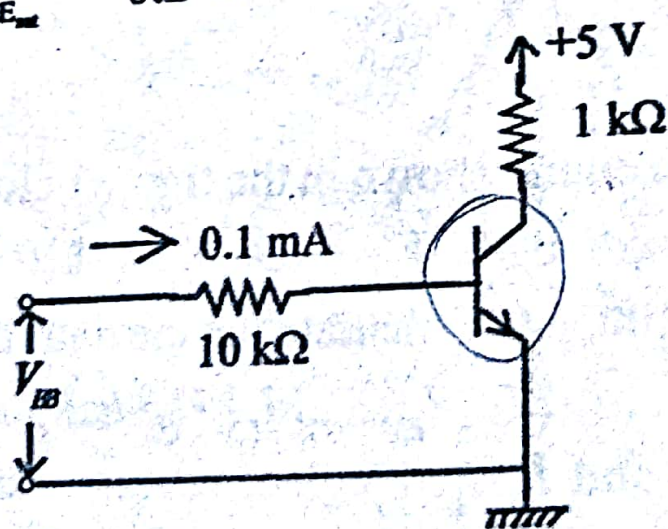
5. (a) Can you realize a BJT by joining two diodes back to back? Justify. 3

(b) For the circuit shown in the figure below $\alpha_1 = 0.98$, $\alpha_2 = 0.96$, $V_{CC} = 24$, $R_C = 120 \Omega$ and $I_E = -100$ mA. Calculate the current and voltage I_{C1} , I_{B1} , I_{B2} , I_{E1} , I_{C2} , I_C , V_{CE} and the ratios I_C/I_B and I_C/I_E . Neglect reverse saturation currents. 7



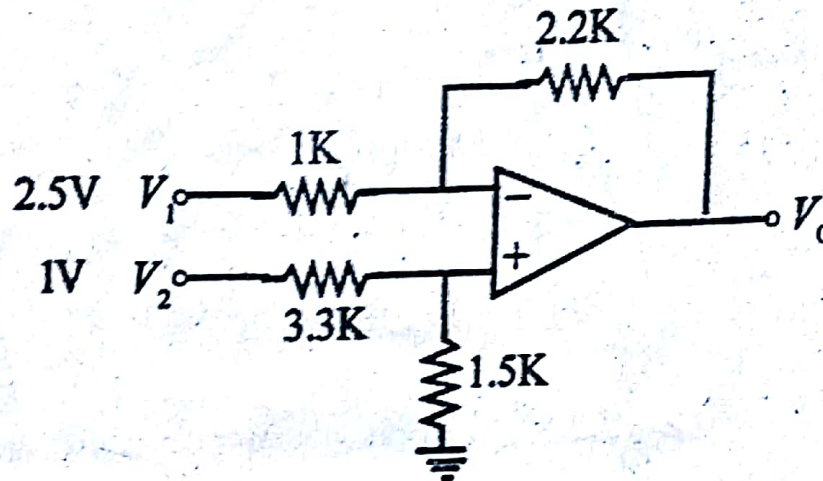
6. (a) What do you mean by race around condition? Explain the working of JK flip-flop. 5

(b) In the circuit shown in Figure below, what would be the minimum value of β such that the transistor is in saturation? Assume $V_{CE_{sat}} = 0.2 \text{ V}$. 5



(5)

7. (a) Calculate the output voltage V_o of the circuit shown in the Figure. The input voltages are $V_1 = 2.5\text{ V}$ and $V_2 = 1\text{ V}$. 5



- (b) With appropriate block diagram, explain the principle operation of AM receiver. 5

8. Write short notes on any two : 5 × 2

- (a) Resistance measurement in CRO
- (b) Needs of modulation
- (c) Inverting and non inverting configuration of OPAMP
- (d) RC coupled amplifier.