Section – A

1. Attempt all parts of this question: \( 10 \times 2 = 20 \)

(a) Distinguish between avalanche and zener breakdown.

(b) For p type semiconductor dopants from 3rd group are typically employed. Can we use dopants from 2nd group? Give reason.

(c) Determine \( I_E, \alpha \) and \( \beta \) of common base transistor circuit given \( I_C = 7 \text{ mA}, I_B = 0.1 \text{ mA} \).

(d) The thickness of base is typically smaller than emitter and base. Why?

(e) What is the basic difference between JFET and MOSFET?

(f) What do you mean by term slew rate in opamp?

(g) Convert \( 120_{10} \) to equivalent hexadecimal.

(h) What do you mean by canonical form of a Boolean expression?

(i) How is voltage measured using CRO?

(j) Describe input characteristics of a digital voltmeter.
2. Attempt any three parts of this question: \(3 \times 10 = 30\)

(a) (i) Explain the formation of potential barrier across a p-n junction.
(ii) Explain the function of the circuit of Fig. 1 and draw the output waveform.

![Fig. 1](image1)

(b) (i) What is base width modulation? How it affects the output characteristics of a transistor in CB and CE configuration?
(ii) The transistor in Fig. 2 has values of \(h_{FE} = 100\). Determine the Q-point values of \(I_C\) and \(V_{CE}\) at both of these temperatures.

![Fig. 2](image2)

(c) (i) Describe different biasing schemes used in JFET amplifiers. State their advantages.
(ii) Given \(I_{DSS} = 9\) mA and \(V_P = -3.5\) V, determine \(I_D\) when \(V_{GS} = 0\) V and \(V_{GS} = -2\) V.

(d) (i) Represent the unsigned numbers 84 and 56 in BCD and then show the steps necessary to form their sum.
(ii) Express \((10110.0101)_2\) in decimal.

(e) (i) Explain how would you measure phase of signal from CRO.
(ii) Describe the operating of CRO with neat block diagram.
6. (a) Implement an OR gate using NAND gates.

(b) Simplify the following function with help of K map:

\[ F(A, B, C, D) = \Sigma(3, 5, 9, 11, 15) + d(2, 4, 6, 10) \]

(c) Discuss the commutative and distributive postulates of Boolean algebra with example.

7. (a) Draw block diagram of digital multimeter and explain its working.

(b) Discuss different controls of CRO.

(c) What is function of time base circuit in CRO? How will you measure the frequency of sinusoidal signal with help of CRO?