

- (e) The intrinsic carrier concentration for Si at room temperature is $1.5 \times 10^{10} \text{ cm}^{-3}$. The electron mobility for intrinsic silicon is $1350 \text{ cm}^2/\text{Vs}$ and hole mobility is $480 \text{ cm}^2/\text{Vs}$. Calculate the resistivity of intrinsic Si at room temperature.
- (f) Show that L_p is the average distance travelled by diffusing carriers before they recombine. The variable L_p represents the distance at which the excess hole concentration falls to $1/e$ of its value at the point of injection of an n-type semiconductor, (all notations carry standard meaning)

2 Answer any **three** of the following : **5×3=15**

- (a) The FB junction of an npn transistor is forward biased by VBF while the collector terminal is left open. What is the value of VCE at this point?
- (b) Derive formula for transistor power dissipation. Obtaining this relationship where on the load line you would expect the power dissipation to the maximum?
- (c) Describe the differences between r_e and hybrid equivalent model for a BJT.
- (d) Derive the expressions for stability of BJT amplifiers.
- (e) When a transistor is in saturation and I_B is fixed, show that for small values of V_{CE} ($< 0.2\text{V}$), V_{BE} increases and V_{BC} reduces with increase in V_{CE} .

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3 Answer any **three** of the following : **4×3=12**

- (a) Convert binary numbers 10111011 and 1101.0110111 into octal numbers.
- (b) Convert 3F29 hexadecimal to its decimal equivalent.
- (c) What are open-collector gates? Explain.
- (d) Elucidate universal gates with the help of suitable example.
- (e) How bases are converted in number systems? What will be 2's complement representation of decimal – 14 into its equivalent hexadecimal?

4 Answer any **two** of the following : **4.5×2=9**

- (a) Explain, how does the frequency of the input signal to an op.amp affects voltage gain.
- (b) Explain chopped and alternate methods of trace development of CROS. How many cycles of a 2-kHZ sinusoidal signal are viewed if the sweep frequency is 1kHz.
- (c) Draw circuit diagram of a multimeter and explain its operation in detail.
