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(2nd Semester)

ELECTRONICS

SECOND PAPER

(**Semiconductor Physics**)

(PART : A—OBJECTIVE)

(Marks : 20)

SECTION—A

(Marks : 5)

Each question carries 1 mark

Answer **all** questions

Tick (✓) the correct answer in the brackets provided :

1. Diffusion capacitance is observed in a p - n junction diode when

- (a) reverse biased ()
- (b) forward biased ()
- (c) leakage current is small ()
- (d) leakage current is large ()

2. The ripple factor of a half-wave rectifier is

(a) 1.21 ()

(b) 0.482 ()

(c) 1.42 ()

(d) 0.842 ()

3. The current amplification factor α_{dc} is given by

(a) $\frac{I_C}{I_E}$ ()

(b) $\frac{I_C}{I_B}$ ()

(c) $\frac{I_B}{I_E}$ ()

(d) $\frac{I_B}{I_C}$ ()

4. In determining the load line, for $I_C = 0$

(a) $V_{CE} = V_{CB}$ ()

(b) $V_{CE} = 0$ ()

(c) $V_{CE} = V_{CC}$ ()

(d) $V_{CC} = 0$ ()

5. In an RC coupled transistor amplifier, mid-frequency ranges between

(a) 50 Hz to 20 kHz ()

(b) 20 Hz to 20 kHz ()

(c) 50 Hz to 200 Hz ()

(d) 20 Hz to 200 Hz ()

(4)

SECTION—B

(Marks : 15)

Each question carries 3 marks

Answer *any* **five** questions

1. Write note on the effect of biasing on depletion layer of a junction diode.

2. What is space-charge capacitance of a p - n junction? What is the typical value of space-charge capacitance?

(6)

3. Write short note on the leakage currents in a transistor for CB and CE configuration.

(7)

4. What are α and β of a transistor? Write the relation between them.

(8)

5. Explain in brief the working of a class B push-pull amplifier.

6. Write note on the characteristics of class A and class B amplifiers.

(10)

7. What is bandwidth? Define bandwidth in terms of dB for an amplifier having maximum voltage gain 100.

8. What are the advantages and disadvantages of transformer coupled amplifier?

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ELECTRONICS

SECOND PAPER

(Semiconductor Physics)

Full Marks : 55

Time : 2 hours

(PART : B—DESCRIPTIVE)

(Marks : 35)

*The figures in the margin indicate full marks
for the questions*

1. (a) What is the significance of a potential barrier in a diode? 2
- (b) Explain with suitable diagram the energy band of a semiconductor. What is the difference between energy level and energy band? 3+2=5

Or

- (a) What do you mean by Zener breakdown and avalanche breakdown? 2
- (b) What do you mean by extrinsic semiconductor? Explain the formation of *p*-type semiconductor materials. 1+4=5
2. (a) Write a note on the reverse characteristic of a Zener diode with suitable diagram. 3
- (b) Describe briefly the working of a *p-n* junction full-wave rectifier. Give the expression for efficiency of a full-wave rectifier. 3+1=4
- Or
- (a) Write a note on the filter circuits consisting of an inductor. 3
- (b) Explain in detail *p-n* junction diode bridge rectifier circuit. 4
3. (a) Explain transistor biasing for normal operation. What is the necessary biasing condition for conduction in transistor? 2
- (b) Describe in brief NPN transistor. Explain with suitable diagram, the CB configuration of a PNP transistor. 2+3=5

Or

- (a) What do you mean by thermal runaway in a transistor? 2
- (b) Describe with suitable diagram, the transistor static characteristic of CE configuration. Mention its difference with CB characteristics. 3+2=5

4. (a) What is a linear amplifier? Explain quiescent point of a transistor amplifier with suitable diagram showing cut-off and saturation. 1+3=4
- (b) Explain in brief the frequency response curve of an amplifier. What is the resonant frequency? 2+1=3

Or

- (a) What do you mean by power gain? Explain how transistor amplifies. 1+3=4
- (b) Write in brief power relations for class B amplifier. What is the maximum overall efficiency of a class A amplifier coupled with a transformer? 2+1=3

5. (a) What do you mean by forward and reverse parameters in hybrid parameters of a transistor? Illustrate the expression for current gain. 2+1+1=4

- (b) A transistor used in CB connection has the following set of parameters :

$$h_{fb} = -0.98, \quad h_{ib} = 36 \, \Omega, \quad h_{rb} = 5 \times 10^{-4}, \\ h_{ob} = 10^{-6} \text{ mho, with } R_S = 2K \text{ and } R_C = 10K$$

Calculate (i) r_{in} , (ii) r_{out} , (iii) A_i and (iv) A_v .

3

Or

With a suitable diagram, explain the frequency response of an RC coupled transistor amplifier. Write down the merits and demerits of this amplifier. 1+4+2=7

★ ★ ★