

2 0 1 2

(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. The leakage current across a p - n junction is due to

- (a) minority carriers ()**
- (b) majority carriers ()**
- (c) junction capacitance ()**
- (d) impurity ()**

2. The maximum efficiency of a half-wave rectifier is

(a) 50% ()

(b) 81.2% ()

(c) 25% ()

(d) 40.6% ()

3. In CB configuration, current transfer characteristic $\alpha_{ac} =$

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

(b) $\frac{\Delta I_B}{\Delta I_E}$ ()

(c) $\frac{\Delta I_C}{\Delta I_B}$ ()

(d) $\frac{\Delta I_C}{\Delta I_E}$ ()

4. The intersection of d.c. load line with the base current in CE transistor circuit is

(a) saturation point ()

(b) cut-off point ()

(c) operating point ()

(d) check point ()

5. The final stages of a multistage amplifier use

(a) RC coupling ()

(b) direct coupling ()

(c) transformer coupling ()

(d) impedance coupling ()

(4)

SECTION—B

(Marks : 15)

Each question carries 3 marks

Answer any **five** questions

1. Give the mechanism of hole current flow in a semiconductor.

2. What are the important electrical properties of capacitor and inductor in making a filter circuit?

(6)

3. What do you mean by thermal runaway?

(7)

4. Show that

$$\beta = \frac{\alpha}{1 - \alpha}$$

where the symbols have their usual meanings in a transistor.

5. What are the advantages and disadvantages of RC coupled amplifier?

6. Write the steps of construction of d.c. load line.

(10)

7. Write a note on depletion layer of a p - n junction diode.

8. Compare the differences between an ordinary junction diode and a Zener diode.

2 0 1 2

(2nd Semester)

ELECTRONICS

SECOND PAPER

(Semiconductor Physics)

Full Marks : 55

Time : 3 hours

(PART : B—DESCRIPTIVE)

(Marks : 35)

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

1. (a) What are intrinsic and extrinsic semiconductors? Briefly explain the formation of n -type semiconductor. 2+3=5
- (b) Classify solids in terms of the energy band diagrams. 2

Or

- (a) Explain, with suitable diagram, the V - I characteristics of a p - n junction diode. 3

- (b) What do you mean by breakdown voltage of a junction diode? Compare between Zener breakdown and avalanche breakdown. 1+3=4

2. (a) What is a rectifier circuit? Show that ripple factor for a half-wave rectifier is 1.21. 1+3=4

- (b) Briefly describe the working of a capacitor filter. 3

Or

Describe how a semiconductor diode can be used as a full-wave rectifier. Derive its expression for efficiency. 3+4=7

3. (a) What is meant by transistor biasing? What are the essentials of a transistor biasing circuit? 1+3=4

- (b) In a transistor, if $I_C = 4.9 \text{ mA}$ and $I_E = 5 \text{ mA}$, what is the value of α ? 3

Or

- (a) Explain, with the diagram, the input characteristic of a CE transistor. 3

- (b) State the advantages of transistor connection in CE mode over other modes of operations. 4

4. (a) Explain how transistor can be used as an amplifier. What do you mean by operating point of a transistor circuit?

3+2=5

- (b) In a transistor circuit, collector load is $4\text{ k}\Omega$ whereas zero signal collector current is 1 mA . Find the operating point if $V_{CC} = 5\text{ V}$.

2

Or

- (a) What is frequency response of an amplifier?

2

- (b) Describe class A, class B, class C and class AB of amplifiers. Illustrate your answer with suitable diagrams.

5

5. (a) What do you understand by hybrid parameter of a transistor?

2

- (b) Draw a hybrid equivalent circuit of common-collector transistor. Deduce an expression for voltage gain and discuss the validity of this expression.

1+3+1=5

Or

- (a) With a neat circuit diagram, explain the operation of an RC coupled transistor amplifier. Obtain the expression for its mid-frequency voltage gain.

1+2+2=5

- (b) Define bandwidth of an amplifier.

2
