

2016

(2nd Semester)

ELECTRONICS

SECOND PAPER

(Semiconductor Physics)

Full Marks : 55

Time : 2½ hours

(PART : B—DESCRIPTIVE)

(Marks : 35)

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

1. (a) What are semiconductors? Explain the energy band description of n -type semiconductor with a suitable diagram. 1+2=3
- (b) Discuss V - I characteristics of a p - n junction diode and explain knee voltage from the characteristics. 3+1=4

Or

- (a) Discuss the capacitive effects in a p - n junction. 4
- (b) Write down the diode equation. How is depletion layer formed in a p - n junction diode? 1+2=3

2. (a) Discuss how semiconductor diode can be used as a full-wave rectifier. 3
- (b) What is ripple factor? Derive the value of ripple factor for a half-wave semiconductor diode. 1+3=4

Or

- (a) A crystal diode having internal resistance r_f 20 is used for half-wave rectification. If the applied voltage v $50 \sin t$ and load resistance R_L 800 , find the efficiency of rectification for this diode. 2
- (b) What is a filter circuit? Explain how a capacitor-input filter smoothens the pulsating output of a rectifier. 1+3=4
- (c) How will you distinguish Zener diode from ordinary semiconductor diode? 1

(3)

3. (a) In CB configuration, show that $I_C = I_E$
and $I_B = (1 - \beta) I_E$. 1+2=3

- (b) Explain with diagram the leakage current in CE circuit of a transistor. 4

Or

- (a) What is thermal runaway? 2

- (b) Explain with diagram the input, output and current transfer characteristics of CE configuration in an *N-P-N* transistor. 5

4. (a) What do you mean by power gain? In a transistor, $i_C = 20$ mA and $i_B = 0.1$ mA, what is the value of β ? 3

- (b) State the advantages of a transistor in CE mode of operation over other mode of operation. 4

Or

- (a) Explain in brief the frequency-response curve of an amplifier. 2

- (b) Describe class A, class B, class C and class AB amplifiers. Illustrate your example with suitable diagram. 5

(4)

5. (a) Draw the *h*-parameter equivalent circuit of transistor in CE configuration. Express the input impedance, current gain and voltage gain of the CE configuration in terms of *h*-parameters and load. 2+3=5

- (b) What are the advantages and disadvantages of transformer-coupled amplifier? 2

Or

- (a) What do you mean by forward and reverse parameters in hybrid parameters of a transistor? 2+1=3

- (b) A transistor uses transformer coupling for amplification. The output impedance of transistor is 10 k Ω while the input impedance of next stage is 2.5 k Ω . Determine the inductance of primary and secondary of the transformer for perfect impedance matching at a frequency of 200 Hz. 2+2=4

Subject Code : ELEC/II/02

Booklet No. A

Date Stamp

.....

To be filled in by the Candidate

DEGREE 2nd Semester
(Arts / Science / Commerce /
.....) Exam., **2016**

Subject

Paper

INSTRUCTIONS TO CANDIDATES

- 1. The Booklet No. of this script should be quoted in the answer script meant for descriptive type questions and vice versa.**
- 2. This paper should be ANSWERED FIRST and submitted within 45 minutes of the commencement of the Examination.**
- 3. While answering the questions of this booklet, any cutting, erasing, over-writing or furnishing more than one answer is prohibited. Any rough work, if required, should be done only on the main Answer Book. Instructions given in each question should be followed for answering that question only.**

To be filled in by the Candidate

DEGREE 2nd Semester
(Arts / Science / Commerce /
.....) Exam., **2016**

Roll No.

Regn. No.

Subject

Paper

Descriptive Type

Booklet No. B

*Signature of
Scrutiniser(s)*

*Signature of
Examiner(s)*

*Signature of
Invigilator(s)*

/236

ELEC/II/02

2 0 1 6

(2nd Semester)

ELECTRONICS

SECOND PAPER

(Semiconductor Physics)

(PART : A—OBJECTIVE)

(Marks : 20)

SECTION—I

(Marks : 5)

Each question carries 1 mark

Answer **all** questions

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

1. If the operating point changes, the h -parameters of a transistor

(a) also change ()

(b) do not change ()

(c) may or may not change ()

(d) are constant ()

/236

(2)

2. The electrons in the conduction band are known as

(a) bound electrons ()

(b) valence electrons ()

(c) free electrons ()

(d) excited electrons ()

3. In most transistors, which region is physically largest?

(a) Emitter ()

(b) Collector ()

(c) Base ()

(d) Emitter and collector ()

4. The leakage current in a semiconductor diode is due to

(a) minority carrier ()

(b) majority carrier ()

(c) junction capacitance ()

(d) junction breakdown ()

ELEC/II/02/236

(3)

5. The intersection of d.c. load line with the base current is

- (a) saturation point ()
- (b) cutoff point ()
- (c) operating point ()
- (d) checkpoint ()

(4)

SECTION—II

(Marks : 15)

Each question carries 3 marks

Answer *any* **five** questions

1. What are the advantages and disadvantages of *R-C* coupled transistor amplifier?

ELEC/II/02/236

(5)

2. A transistor has $\beta = 98$, $I_B = 100 \text{ } \mu\text{A}$ and $I_{CO} = 6 \text{ } \mu\text{A}$. Calculate I_C and I_E .

(6)

3. Why do conduction band electrons possess higher energy than those electrons in the valence band?

ELEC/II/02/236

(7)

4. Write the relation between α and β of a transistor.

(8)

5. Draw the different types of energy band diagram in a solid.

(9)

- 6.** What are the different classifications of transistor amplifier?

(10)

- 7.** Discuss the difference between Zener and avalanche breakdowns of a junction diode.

(11)

8. Explain the characteristics of a class A transistor amplifier.
