

2014

(2nd Semester)

ELECTRONICS

SECOND PAPER

(**Semiconductor Physics**)

(PART : A—OBJECTIVE)

(Marks : 20)

SECTION—A

(Multiple Choice)

(Marks : 5)

Each question carries 1 mark

Answer **all** questions

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

1. When a p - n junction diode is reverse biased, then
- (a) both the potential barrier and depletion layer are increased ()
 - (b) both the potential barrier and depletion layer are decreased ()
 - (c) the potential barrier is increased but the depletion layer is decreased ()
 - (d) the potential barrier is decreased but the depletion layer is increased ()

2. The phase difference between the input signal and output signal in a common-emitter amplifier is (in radian)

(a) π ()

(b) $\pi / 2$ ()

(c) 2π ()

(d) 0 ()

3. In a full-wave rectifier circuit operating from 50 Hz mains frequency, the fundamental frequency of the ripple in the output would be

(a) 25 Hz ()

(b) 50 Hz ()

(c) 100 Hz ()

(d) 200 Hz ()

4. In a transistor as an amplifier, if $\alpha = 0.95$, then β is

(a) 1 ()

(b) 0.19 ()

(c) 1.9 ()

(d) 19 ()

5. Zener diode is used for

- (a) amplification ()
- (b) rectification ()
- (c) stabilization ()
- (d) producing oscillation ()
in an oscillator

(4)

SECTION—B

(Marks : 15)

Each question carries 3 marks

Answer any **five** questions

1. Write a brief note on the formation of energy band in solids.

(5)

2. Establish the relation α and β of a transistor.

3. Draw the three different modes of configuration or connection of a transistor in a circuit.

4. Distinguish between n -type and p -type semiconductors on the basis of energy band diagram.

5. Draw the frequency response curves in the case of *R-C* coupled amplifier and transformer coupled amplifier.

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

(10)

7. Write a note on the characteristics of class *A* and class *B* amplifiers.

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

(4)

II/ELEC (ii)

Or

The h parameters of a transistor are given to be $h_{fe} = 330$, $h_{ie} = 4500 \Omega$, $h_{re} = 2 \times 10^{-4}$ and $h_{oe} = 3 \times 10^{-5}$ mho. The transistor is used in a CE amplifier with a load resistance $5 \text{ k}\Omega$ and a source resistance of $10 \text{ k}\Omega$. Calculate the current gain, voltage gain, input impedance and output impedance.

$$1\frac{1}{2} + 1\frac{1}{2} + 2 + 2 = 7$$

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(2nd Semester)

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) Explain how the depletion region of a p - n junction diode changes when it is
(i) forward biased and (ii) reverse biased. 2
- (b) What is rectification? Explain how a diode works as a full-wave rectifier. 1+4=5

Or

- (a) Classify solids in terms of energy band diagrams. 3

(2)

- (b) Distinguish between *n*-type and *p*-type semiconductors with the help of energy band-diagrams. 2+2=4

2. (a) What is Zener diode? What do you mean by breakdown voltage of a junction diode? 1+1=2
- (b) Compare between Zener breakdown and avalanche breakdown. 2
- (c) Describe briefly the working of a capacitor filter. 3

Or

- (a) Write a note on the reverse characteristics of a Zener diode with suitable diagram. 3
- (b) Explain, with suitable diagram, the *V-I* characteristics of *p-n* junction diode. 3
- (c) The applied input a.c. power to a half-wave rectifier is 100 watts. If the d.c. output power is 40 watts, find its rectification efficiency. 1

3. (a) Explain with a diagram, the input characteristics of a CE transistor. 3
- (b) State the advantages of a transistor in CE mode of operation over other mode of operations. 4

(3)

Or

- (a) Explain the working of (i) an *n-p-n* transistor and (ii) a *p-n-p* transistor. 3+3=6
- (b) In a transistor, if $I_E = 5 \text{ mA}$ and $I_B = 0.1 \text{ mA}$, what is the value of α ? 1

4. (a) What is frequency response of an amplifier? 2
- (b) Describe class A, class B, class C and class AB amplifiers. Illustrate your answer with suitable diagrams. 5

Or

- (a) What do you mean by power gain? Explain how a 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 understand by hybrid parameter of a transistor? 2
- (b) Draw a hybrid equivalent circuit of (i) common-emitter transistor and (ii) common-base transistor. Deduce and expression for voltage gain in common-emitter transistor. 2+3=5