Printed Page:- 04 **Subject Code:- AEC0302N**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: III - THEORY EXAMINATION (2023 - 2024)

Subject: Electronic Devices

Time: 3 Hours **Max. Marks: 100**

General Instructions:

IMP: *Verify that you have received the question paper with the correct course, code, branch etc.*

1. *This Question paper comprises of* ***three Sections -A, B, & C.*** *It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.*

2. *Maximum marks for each question are indicated on right -hand side of each question.*

3. *Illustrate your answers with neat sketches wherever necessary.*

4. *Assume suitable data if necessary.*

5. *Preferably, write the answers in sequential order.*

6. *No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.*

SECTION-A 20

1. Attempt all parts:-

1-a. The resistivity of a semiconductor …….. conductors and insulators.(CO1) 1

(a) More than that of

(b) Lies between that of

(c) Less than that of

(d) None of the above

1-b. In a reverse-biased PN junction, the current through the junction increases abruptly at…….(CO1) 1

(a) 0.5V

(b) 1.1V

(c) 0.7V

(d) Breakdown voltage

1-c. Two types of bipolar junction transistors are _____ and _____. (CO2) 1

(a) NPN and PNP

(b) PNN and NNP

(c) PPN and NNP

(d) None of the above

1-d. The base current is the _____ of the emitter and collector currents. (CO2) 1

(a) Sum

(b) difference

(c) Product
(d) None of these

1-e. The BJT is a _____ device. The FET is a _____ device. (CO3) 1

(a) bipolar, bipolar
(b) bipolar, unipolar
(c) unipolar, bipolar
(d) unipolar, unipolar

1-f. Which of the following terminals does not belong to the MOSFET? (CO3) 1

(a) Drain
(b) Gate
(c) Source
(d) Base

1-g. Field Effect Transistor is.....(CO4) 1

(a) an unipolar and current controlled device
(b) a bipolar and current controlled device
(c) an unipolar and voltage controlled device
(d) a bipolar and voltage controlled device

1-h. A BJT is a _____controlled device.(CO4) 1

(a) current
(b) voltage
(c) Enerrgy
(d) None of the above

1-i. In Zener diode, the breakdown is due to Zener effect, has a doping (CO5) 1

(a) Lowest
(b) Moderate
(c) High
(d) Low

1-j. Varactor diodes are operated in _____ region to achieve maximum efficiency possible.(CO5) 1

(a) Cutoff region
(b) Saturation region
(c) Reverse saturation region
(d) Active region

2. Attempt all parts:-

2.a. Briefly explain Pauli exclusion principle.(CO1) 2

2.b. Calculate β for BJT transistor for which $\alpha = 0.99$.For collector currents of 10 mA, find the base current of the transistor.(CO2) 2

2.c. Briefly explain Pinch off voltage in JFET. (CO3) 2

2.d. Sketch the ac equivalent model for a JFET if I_{DSS} = 10 mA, V_P = -4 V, V_{GSQ} = -2 V, and g_{os} = 25 mS.(CO4) 2

2.e. A Si solar cell has a short-circuit current of 150 mA and an open-circuit voltage of 0.8 V under full solar illumination. The fill factor is 0.8. What is the maximum power delivered to a load by this cell? (CO5) 2

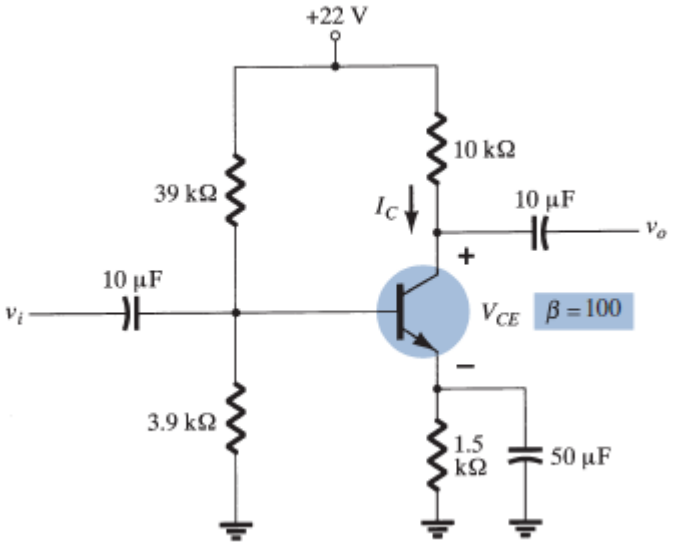
SECTION-B 30

3. Answer any five of the following:-

3-a. Calculate the fermi level position in Si containing 10^{20} Boron atoms/cm^3 at 300 degree K assuming 50% of the impurities are ionized at this temperature. Also calculate the equilibrium electron and holes concentrations.(CO1) 6

3-b. Explain why intrinsic semiconductor behaves as an insulator at 0K.(CO1) 6

3-c. Determine the dc bias voltage V_{CE} and the current I_C for the voltage-divider configuration of Figure. (CO2) 6



3-d. Explain fixed bias method of transistor biasing with it's DC load line. (CO2) 6

3.e. Explain the construction, working and application of N channel JFET. (CO3) 6

3.f. Explain AC analysis of MOS Common Source Amplifier and calculate its different parameters.(CO4) 6

3.g. Explain working operation with diagram of Solar cell. What is the fill factor of solar cell? (CO5) 6

SECTION-C 50

4. Answer any one of the following:-

4-a. Establish the relation between Energy(E) and Wave vector (K) and draw & explain the E-K diagram for direct band and indirect band semiconductor. (CO1) 10

4-b. Draw & explain the silicon semiconductor energy band diagram. (CO1) 10

5. Answer any one of the following:-

5-a. Draw the common emitter circuit and sketch the input and output characteristics. Also explain active region, cutoff region and saturation region by indicating them 10

on the characteristic curve. (CO2)

5-b. Draw the circuit diagram of Voltage Divider Bias of a transistor. Explain its working. (CO2) 10

6. Answer any <u>one</u> of the following:-

6-a. Explain working principle and V-I characteristics of Enhancement type N-MOSFET. (CO3) 10

6-b. Given I_{DSS} = 12 mA and V_P = -4 V, sketch the transfer characteristics for the JFET. (CO3) 10

7. Answer any <u>one</u> of the following:-

7-a. Draw & explain single stage CE Voltage-divider bias configuration with r_e model and calculate Z_{in}, Z_o, A_v and $A_{i.}$ (CO4) 10

7-b. Explain AC analysis of JFET Common source fixed bias configuration and calculate Z_{in}, Z_o, A_v. (CO4) 10

8. Answer any <u>one</u> of the following:-

8-a. Explain Zener effect and also describe the working principle of Zener diode. (CO5) 10

8-b. Explain the operation of Tunnel diode with VI characteristics and energy band diagram. (CO5) 10