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

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: III - CARRY OVER THEORY EXAMINATION - APRIL 2023

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. A semiconductor is formed by.....bonds (CO1) 1

(a) Covalent

(b) Electrovalent

(c) Co-ordinate

(d) None of the above

1-b. The potential difference across the p-n junction is called..... (CO1) 1

(a) Barrier potential

(b) Height of barrier

(c) Barrier Voltage

(d) All of them

1-c. The value of beta DC _____ (CO2) 1

(a) is fixed for any particular transistor.

(b) varies with temperature.

(c) varies with Ic.

(d) varies with temperature and Ic.

1-d. When no ac input signal is applied to CE transistor load line can be plotted...(CO2) 1

(a) Vcc Vs Vbc

(b) Vce Vs Ic

(c) Vce Vs Vcc

(d) none of these

1-e. What three areas are the drain characteristics of a JFET (VGS = 0) divided into? (CO3) 1

(a) ohmic, constant-current, breakdown

(b) pinch-off, constant-current, avalanche

(c) ohmic, constant-voltage, breakdown

(d) none of these

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. The input and output signals are in phase in a _____ configuration. (CO4) 1

(a) fixed-bias

(b) source-follower

(c) voltage-divider

(d) self-bias

1-h. Choose the correct statement (CO4) 1

(a) MOSFET is a uncontrolled device

(b) MOSFET is a voltage controlled device

(c) MOSFET is a current controlled device

(d) MOSFET is a temperature controlled device

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. A Schottky diode _____ (CO5) 1

(a) has current flow due to holes only

(b) has no reverse recovery time

(c) has large amount of storage charges

(d) has zero cut-in voltage

2. Attempt all parts:-

2.a. Given an intrinsic semiconductor, state two physical processes for increasing its conductivity. Explain briefly. (CO1) 2

2.b. Write the temperature effect on β. (CO2) 2

2.c. Draw the symbol of Depletion and enhancement mode MOSFET. (CO3) 2

2.d. Define Drain resistance. (CO4) 2

2.e. What is the effect of temperature in Solar Cell? (CO5) 2

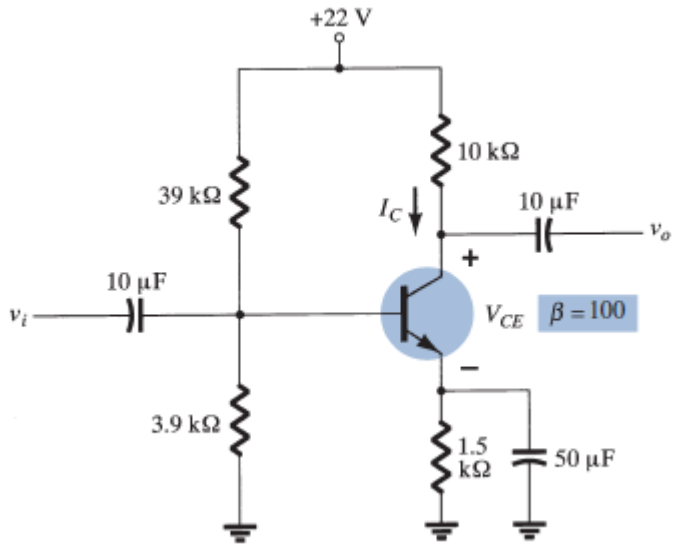
SECTION B **30**

3. Answer any <u>five</u> of the following:-

3-a. Explain the temperature effect on (a) Majority and Minority carrier concentration, (b) conductivity of the extrinsic semiconductor (c) mobility of charge carrier. (CO1) 6

3-b. Why Si is preferred over Ge? Also, explain the term impurity and doping. (CO1) 6

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



(CO2)

3-d. (a) Consider an npn transistor with V_{BE} =0.7 V at I_C =1 mA. Find V_{BE} at I_C=0.1 mA and 10 mA. 6

(b) Transistors of a certain type are specified to have β values in the range of 50 to 150. Find the range of their α values. (CO2)

3.e.	Given IDSS = 12 mA and VP = -4 V, sketch the transfer characteristics for the JFET transistor. (CO3)	6
3.f.	Why the turn-on transient of a BJT is faster when the device is driven into over saturation? (CO4)	6
3.g.	Explain the operation of Tunnel diode with VI characteristics and energy band diagram. (CO5)	6

SECTION C **50**

4. Answer any one of the following:-

4-a.	Consider a silicon abrupt P-N junction at 300K with Na = 1.5×10^16/cm3 and Nd = 10^15 /cm3.Taking ni=1.5×10^10 /cm3,calculate the value of contact potential also calculate width of depletion region. (CO1)	10
4-b.	Derive the expression for contact potential of a p-n junction. (CO1)	10

5. Answer any one of the following:-

5-a.	Explain working principle and V-I characteristics of BJT with common collector configuration. (CO2)	10
5-b.	Explain fixed bias method of transistor biasing with it's DC load line. (CO2)	10

6. Answer any one of the following:-

6-a.	Define surface potential. Does the surface potential change significantly with gate voltage once threshold is reached? (CO3)	10
6-b.	Draw and explain a typical drain characteristics family for an n-channel JFET. Identify the VGS for each characteristic. (CO3)	10

7. Answer any one of the following:-

7-a.	How JFET CS amplifier different from MOS CS amplifier? Explain. (CO4)	10
7-b.	Explain the construction and working principle of MOSFET. Also explain short channel effect. (CO4)	10

8. Answer any one of the following:-

8-a.	Explain working of Varactor diode with VI chararacteristics. Also discuss the characteristics and application of varactor diode. (CO5)	10
8-b.	A solar cell of area 1.0 cm2, operating at 1.0 sun intensity, has a short circuit current of 20 mA,and an open circuit voltage of 0.65V.Assuming room temperature operation and thermal equivalent voltage of 26 mV, Find the open circuit voltage (in volts), correct to two decimal places at 0.2 sun intensity. (CO5)	10