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 (2024 - 2025)

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.*

<u>SECTION-A</u> 20

1. Attempt all parts:-

1-a. When a pure semiconductor is heated, it's resistance………(K1,CO1) 1

(a) Goes down
(b) Goes up
(c) Remains the same
(d) None of the above

1-b. When a PN junction is reverse biased _______________. (K1,CO1) 1

(a) Holes and electrons tend to concentrate towards the junction
(b) The barrier tends to break down
(c) Holes and electrons tend to move away from the junction
(d) None of these

1-c. What is the order of doping, from heavily to lightly doped, for each region? (K1,CO2) 1

(a) base, collector, emitter
(b) emitter, collector, base
(c) emitter, base, collector
(d) collector, emitter, base

1-d. In BJT, Determine the value of alfa when beta = 100. (K1,CO2) 1

(a) 1.01
(b) 101

(c) 0.99

(d) Cannot be solved with the information provided

1-e. For a JFET, the value of V_{DS} at which I_D becomes essentially constant is the (K1,CO3) 1

(a) pinch-off voltage.

(b) cutoff voltage.

(c) breakdown voltage.

(d) None of the above

1-f. In a MOSFET, the polarity of the inversion layer is the same as that of the (K1,CO3) 1

(a) charge on the electrode

(b) minority carries in the drain

(c) majority carries in the substrate

(d) majority carries in the source

1-g. What is (are) the function(s) of the coupling capacitors C1 and C2 in an FET circuit? (K1,CO4) 1

(a) to create an open circuit for dc analysis

(b) to isolate the dc biasing arrangement from the applied signal and load

(c) to create a short-circuit equivalent for ac analysis

(d) All of the above

1-h. What is the typical value for the input impedance Zi for JFETs? (K1,CO4) 1

(a) 100 kohm

(b) 1 M ohm

(c) 10M ohm

(d) 1000M ohm

1-i. Which of the following should not be the characteristic of the solar cell material? (K1,CO5) 1

(a) High Absorption

(b) High Conductivity

(c) High Energy Band

(d) High Availability

1-j. In Zener diode, the breakdown is due to Zener effect, has a doping (K1,CO5) 1

(a) Lowest

(b) Moderate

(c) High

(d) Low

2. Attempt all parts:-

2.a. Define Mobility and write the relation between drift velocity and 2

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mobility.(K1,CO1)

2.b.	What is need of Biasing? (K1,CO2)	2
2.c.	Define Pinch off voltage. (K1,CO3)	2
2.d.	Sketch the ac equivalent model for a JFET. (K1,K2,CO4)	2
2.e.	Define tunneling phenomenon.(K1,CO5)	2

<u>SECTION-B</u> 30

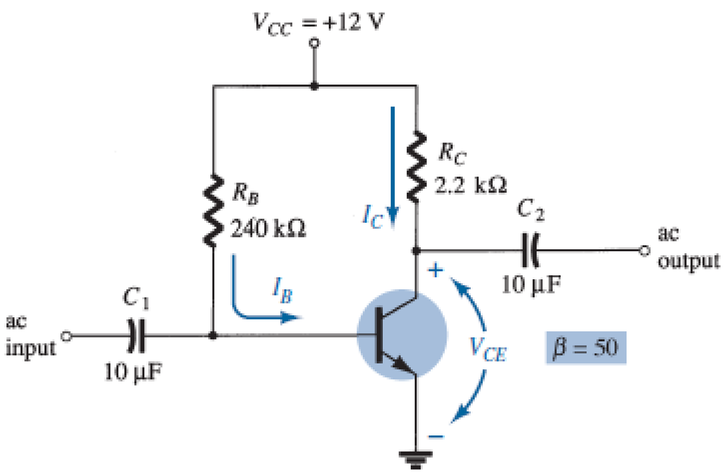
3. Answer any <u>five</u> of the following:-

3-a. Consider a Si sample doped with Nd= 10^20/cm^3 donor atoms. If the sample is additionally doped with Na = 10^18/cm^3 acceptor atoms, find the approximate number of electron/cm^3 in the sample at T=300 degree K. (intrinsic carrier concentration is 1.5x10^10 /cm^3.) also find the fermi position with respect to Ei. (K1,K2,CO1) 6

3-b. How temperature affect the mobility? Explain Impurity scattering and Lattice scattering. (K1,CO1) 6

3-c. Determine the following for the fixed-bias configuration of Figure (K1,K2,CO2) 6

a. I_{BQ} and I_{CQ}.
b. V_{CEQ}.
c. V_B and V_C.
d. V_{BC}..



3-d. Explain working principle and VI characteristics of Common Emitter Configuration. (K1,CO2) 6

3.e. Compare of BJT and FET in details. (K1,CO3) 6

3.f. Explain AC analysis of MOS Common Source Amplifier and calculate its different parameters.(K1,K2,CO4) 6

3.g. Explain tunnel diode operation with the help of energy band diagrams. (K1,CO5) 6

<u>SECTION-C</u> 50

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

4-a. Define Effective Mass and derive its expression. What is difference between 10

Direct and Indirect Semiconductors? Write their applications. (K1,CO1)

4-b.	Draw Volt-Ampere Characteristics & Derive the Diode Equation. (K1,K2,CO1)	10

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

5-a.	Draw the circuit diagram of voltage divider bias of a transistor. Explain its working. (K1,CO2)	10
5-b.	Explain the working of BJT as an Amplifier and as a switch. (K1,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. (K1,CO3)	10
6-b.	Explain working principle of JFET with its VI characteristics. (K1,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 $A_{i.}$ (K1,K2,CO4)	10
7-b.	Explain small signal equivalent model for JFET. Calculate Input Resistance Ri, Output Resistance Ro, and Voltage gain Av. (K1,K2,CO4)	10

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

8-a.	With neat diagram explain the working of varactor diode along with VI characteristics. Also write its applications.(K1,CO5)	10
8-b.	Explain the working principle of Solar Cell with its VI characteristics. How it is different from Photo Diode? A Si solar cell has a short circuit current of 150μA and a open circuit voltage of 1V under full solar illumination. The fill factor is 0.9. what is the maximum power delivered to a load by this solar cell? (K1,K2,CO5)	10

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