Printed Page:- 05 **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 - AUGUST 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. The Fermi-level in a n type semiconductor is shifted towards ..... (CO1) 1

(a) Conduction band

(b) Valance band

(c) Does not shift

(d) None of these

1-b. In FB case ideal diode acts like a ..... switch. (CO1) 1

(a) short

(b) open

(c) normal

(d) None of these

1-c. For what kind of amplifications can the active region of the common-emitter configuration be used? (CO2) 1

(a) Voltage

(b) Current

(c) Power

(d) All of the above

1-d. A BJT consists of three regions: (CO2) 1

(a) base, emitter and collector.

(b) base, source and collector.

(c) base,gate and collector.

(d) gate, source and collector.

1-e. The value of transconductance decreases in simplified low frequency equivalent circuit of n-channel MOSFET due to increase in the value of _____ (CO3) 1

(a) Source resistance

(b) Load resistance

(c) Both a and b

(d) None of the above

1-f. It is the insulating layer of _____ in the MOSFET construction that accounts for the very desirable high input impedance of the device. (CO3) 1

(a) SiO

(b) GaAs

(c) SiO2

(d) HCl

1-g. MOSFETs make better power switches than BJTs because they have (CO4) 1

(a) ower turn-off times.

(b) lower on-state resistance.

(c) a positive temperature coefficient.

(d) all of the above

1-h. The self-bias configuration eliminates the need for (CO4) 1

(a) two dc supplies

(b) 1 dc supplies

(c) two ac supplies

(d) None of these

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

(a) High Absorption

(b) High Conductivity

(c) High Energy Band

(d) High Availability

1-j. The Tunnel diode is best suited for (CO5) 1

(a) Amplitude limiters

(b) Amplifiers

(c) Oscillators

(d) Rectifiers

2. Attempt all parts:-

2.a. Explain physically the meaning of the following statement: An electron and a hole recombine and disappear. (CO1) 2

2.b. What is need of Biasing? (CO2) 2

2.c. Define depletion mode for n-channel MOSFET. (CO3) 2

2.d. Draw the symbol of MOSFET and JFET. (CO4) 2

2.e. Draw a circuit which uses a breakdown diode to regulate the voltage across a variable load and normal input. (CO5) 2

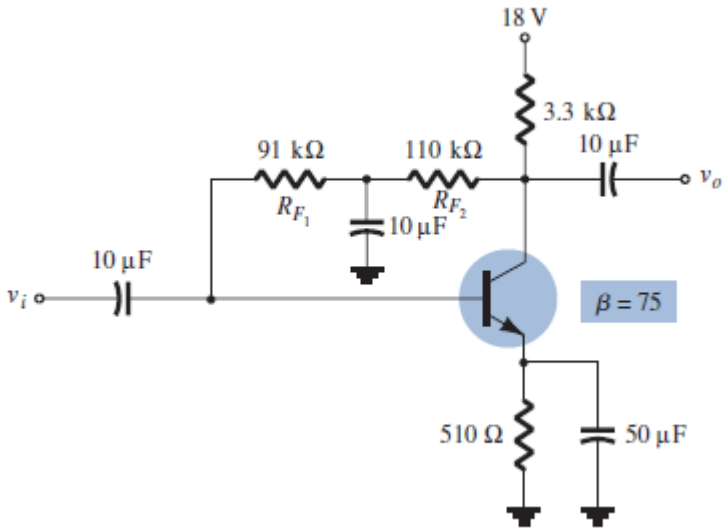
SECTION B **30**

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

3-a. What is Fermi Level? Show the fermi level position in N-type semiconductor at 0,300 and 400 Kelvin. (CO1) 6

3-b. Consider a Ge crystal at room temperature doped with 5×10^15/cm3 As atoms. Find the equilibrium electron, the hole concentrations, and the position of the Fermi level w.r.t intrinsic energy level (Ei). Draw the energy band diagram also. (CO1) 6

3-c. Determine the quiescent levels of I_{CQ} and V_{CEQ} for the network of Figure. (CO2) 6



3-d.	Compare between FET & BJT. Explain the factors which determine the switching speed of a BJT. (CO3)	6
3.e.	Draw and explain small signal equivalent model for CE configuration. (CO4)	6
3.f.	What is difference between avalanche and zener breakdown? Explain in details. (CO2)	6
3.g.	Enumerate the construction and operation of LED. (CO5)	6

SECTION C **50**

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

4-a.	Consider a particular material with Fermi energy of 6.25eV and that the electrons in the material follow the Fermi-Dirac distribution function. Calculate the temperature at which there is a 1.0% probability that a state of 0.30eV below the Fermi energy level will not contain electron. (CO1)	10
4-b.	Differentiate Direct and Indirect Semiconductor with suitable E-K band diagram. (CO1)	10

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

5-a.	Draw the common base configuration and sketch the input and output characteristics. Also explain active region, cutoff region and saturation region by indicating them on the characteristic curve. (CO2)	10
5-b.	An npn silicon transistor has V_{CC} = 6 V and the collector load R_C = 2.5 kΩ. Find : (i) The maximum collector current that can be allowed during the application of signal for faithful amplification. (ii) The minimum zero signal collector current required. (CO2)	10

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

6-a.	Sketch the C–V characteristics of a MOS capacitor with an n-type substrate under the low-frequency condition. How do the characteristics change for the	10

high-frequency condition? (CO3)

6-b. Explain Enhancement mode N-MOSFET. Identify all parts of the device and explain its operation. (CO3) 10

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

7-a. Explain small signal equivalent model for MOSFET. Calculate Input Resistance Ri, Output Resistance Ro, and Voltage gain Av. (CO4) 10

7-b. Draw and explain single stage CS amplifier & CE amplifier with re model. (CO4) 10

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

8-a. Explain the construction and operation of LED. Draw the different characteristics of LED. (CO5) 10

8-b. Explain working of Varactor diode with VI characteristics. Also discuss how it can be used as variable capacitor. (CO5) 10