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**BTECH**  
**(SEM III) THEORY EXAMINATION 2025-26**  
**ELECTRONIC DEVICES**

TIME: 3 HRS

M.MARKS: 70

**Note:** 1. Attempt all Sections. If require any missing data; then choose suitably.

**SECTION A**

1. Attempt *all* questions in brief.

2 x 7 = 14

Qno.	Question	Marks	CO
a.	What is the Fermi level, and how does it relate to the electronic properties of a material?	2	1
b.	Define effective mass of an electron.	2	1
c.	Differentiate between drift current and diffusion current in a semiconductor.	2	2
d.	Define Mobility. Write relation between drift velocity and mobility.	2	2
e.	Write difference between Avalanche and Zener breakdown.	2	3
f.	What is a photodiode?	2	3
g.	Why BJT is called as current controlled device?	2	4

**SECTION B**

2. Attempt any *three* of the following:

3 X 7 = 21

Qno.	Question	Marks	CO
a.	Establish the relation between Energy and Wave vector (K) and draw & explain the E-K diagram for direct band semiconductor and indirect band semiconductor.	10	1
b.	Using the concept of drift and diffusion of carriers, derive Einstein's relation.	10	2
c.	How a PN junction diode is working? Draw and explain V-I characteristics of PN diode with neat diagrams.	10	3
d.	Draw and illustrate the Ebers-Moll model of BJT.	10	4
e.	Explain the construction and principle of operation of N-channel JFET. Draw its drain and transfer characteristics.	10	5

**SECTION C**

3. Attempt any *one* part of the following:

1 X 7 = 7

Qno.	Question	Marks	CO
a.	Derive the time dependent and time independent Schrodinger wave equation.	10	1
b.	What is the Heisenberg Uncertainty Principle, and how does it relate to the measurement of complementary observables?	10	1



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4. Attempt any *one* part of the following:

1 X 7 = 7

Qno.	Question	Marks	CO
a.	Calculate the fermi level position in Si containing $10^{17}$ As atoms/cm <sup>3</sup> at 300 K assuming 50% of the impurities are ionized at this temperature. Also calculate the equilibrium electron and holes concentrations & Draw the resulting band diagram	10	2
b.	Explain generation and recombination of carriers in semiconductors.	10	2

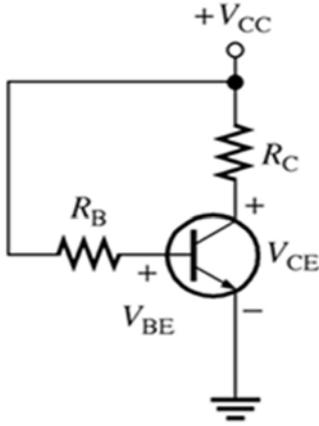
5. Attempt any *one* part of the following:

1 X 7 = 7

Qno.	Question	Marks	CO
a.	Derive the expression of depletion width in a p-n junction.	10	3
b.	Describe the construction, working principle, and characteristics of the following devices: (a) Schottky diode (b) Light Emitting Diode (LED)	10	3

6. Attempt any *one* part of the following:

1 X 7 = 7

Qno.	Question	Marks	CO
a.	Determine the Q-point values of $I_C$ and $V_{CE}$ for the circuit in Figure. Assume $V_{CE} = 8$ V, $R_B = 360$ k $\Omega$ and $R_C = 2$ k $\Omega$ . Also Construct the dc load line and plot the Q-point. 	10	4
b.	Draw and explain the input and output I-V characteristics of a BJT in Common Emitter configuration.	10	4

7. Attempt any *one* part of the following:

1 X 7 = 7

Qno.	Question	Marks	CO
a.	Define MOS capacitor and explain its basic structure.	10	5
b.	Explain the Construction, Working and Characteristics of n-Channel Enhancement Type MOSFET.	10	5