Roll No.												

PRESIDENCY UNIVERSITY

BENGALURU

End - Term Examinations – May / June 2026

Date: 29- 05-2026 **Time:**09:30am – 12:30pm

School: SOE	**Program:** B.Tech. (VLSI)	
Course Code: ECE2509	**Course Name:** Solid State Electronics	
Semester: IV	**Max Marks:** 100	**Weightage:** 50%

CO - Levels	CO1	CO2	CO3	CO4	CO5	CO6	CO7
Marks	10	10	17	17	30	12	04

Instructions:

(i) Read all questions carefully and answer accordingly.

(ii) Do not write anything on the question paper other than roll number.

Part A

Answer ALL the Questions. Each question carries 2marks. **10Q x 2M=20M**

1.	Draw the energy band diagram of a p–n junction diode under forward bias.	2 Marks	L1	CO3
2.	Define the punch-through effect in a Bipolar Junction Transistor (BJT).	2 Marks	L1	CO4
3.	Differentiate between Ohmic contact and Schottky contact.	2 Marks	L1	CO6
4.	Define a Field Effect Transistor (FET).	2 Marks	L1	CO5
5.	Explain why a Field Effect Transistor (FET) is called a voltage-controlled device.	2 Marks	L2	CO5
6.	Define pinch-off voltage in a Junction Field Effect Transistor (JFET).	2 Marks	L1	CO5
7.	Describe the basic structure of a MOS capacitor.	2 Marks	L1	CO5
8.	Explain channel length modulation in MOSFETs.	2 Marks	L2	CO5
9.	Explain how artificial intelligence (AI) algorithms can be used to predict the type of semiconductor using bandgap energy and resistivity data.	2 Marks	L3	CO7
10.	Explain how machine learning techniques can be applied to extract the saturation current of a diode from its I–V characteristics.	2 Marks	L3	CO7

Part B

Answer the Questions. **Total Marks 80M**

11.	a.	Explain how energy bands are formed in solids from atomic energy levels.	10 Marks	L2	CO1
		Or			
12.	a.	Explain the concepts of electrons and holes in semiconductors and describe their role in electrical conduction.	10 Marks	L2	CO1
13.	a.	Discuss the impact of excess carriers on semiconductor behavior.	10 Marks	L2	CO2
		Or			
14.	a.	Explain the relationship between electrical conductivity, carrier concentration, and mobility in semiconductors.	10 Marks	L2	CO2
15.	a.	Explain the construction and working principle of a tunnel diode with suitable diagrams.	10 Marks	L2	CO6
		Or			
16.	a.	Explain the construction and working principle of a HEMT with appropriate diagrams.	10 Marks	L2	CO6
17.	a.	Using an energy band diagram, determine the contact potential of a p–n junction.	5 Marks	L3	CO3
	b.	Explain the I–V characteristics of a p–n junction diode and describe the different regions of operation.	10 Marks	L2	CO3
		Or			
18.	a.	Explain the junction capacitance of an abrupt p–n junction under reverse bias.	5 Marks	L3	CO3
	b.	Using an energy band diagram, explain the mechanism of reverse-bias breakdown due to the Zener effect.	10 Marks	L2	CO3
19.	a.	Analyze the effect of base-width narrowing on collector current in a BJT.	5 Marks	L3	CO4
	b.	Explain the minority carrier distribution in the active and saturation regions of BJT operation.	10 Marks	L2	CO4
		Or			
20.	a.	Using minority carrier distribution profiles, analyze the effect of temperature increase on terminal currents in a BJT.	5 Marks	L3	CO4
	b.	Explain the current flow mechanism and terminal relationships in an NPN transistor.	10 Marks	L2	CO4
21.	a.	Explain the structure and operation of a JFET with relevant diagrams.	10 Marks	L2	CO5
	b.	Explain the significance of flat-band voltage on the behavior of MOS devices.	10 Marks	L3	CO5
		Or			
22.	a.	Explain the drain and transfer characteristics of a JFET and discuss their significance.	10 Marks	L2	CO5
	b.	Apply the concept of channel length modulation to analyze variations in drain current in short-channel MOSFETs.	10 Marks	L3	CO5