R22 Regulation *Subject code:4E3EA*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A+' Grade)

B.Tech III Semester Regular/Supplementary Examinations, December 2025

SEMICONDUCTORS DEVICES AND CIRCUITS

(Common to CSE, CSE(AI&ML) & CSE(DS))

Maximum Marks: 60 Date: 30.12.2025 Duration: 3 hours

Note:
1. **This question paper contains two parts A and B.**
2. **Part A is compulsory which carries 10 marks. Answer all questions in Part A.**
3. **Part B consists of 5 Units. Answer any one full question from each unit.**
4. **Each question carries 10 marks and may have a, b, c, d as sub questions.**

Part-A

All the following questions carry equal marks (10X1M=10 Marks)		Marks	CO	BTL
1.a)	What is a Semiconductor?	1M	1	2
b)	Write down the diode current equation and its components.	1M	1	2
c)	Draw the equivalent circuit of Tunnel diode.	1M	2	2
d)	Mention some applications of UJT.	1M	2	1
e)	What is ripple factor?	1M	3	2
f)	Define peak inverse Voltage.	1M	3	1
g)	What are the types of transistor configurations?	1M	4	1
h)	Define operating point.	1M	4	2
i)	Define pinch off voltage.	1M	5	2
j)	List the any two applications of MOSFET	1M	5	2

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
2	a) Explain the Characteristics of PN junction diode under Forward and Reverse Bais conditions. b) For a Ge diode, the I0=2μA and the voltage of 0.26V is applied. Calculate the forward and reverse dynamic resistance values at room temperature.	5M 5M	1	2
	OR			
3	a) Derive an expression for transition capacitance of a diode. b) Obtain the transition capacitance C_T of a junction diode at a reverse bias voltage of 12V if C_T of the diode is given as 15 pF at a reverse bias of 8V.	5M 5M	1	4
4	a) How Zener diode can be used as Voltage Regulator? Explain with neat sketches. b) Explain Avalanche and Zener Breakdowns.	5M 5M	2	3

	OR			
5	With the help of energy band diagrams explain the operation and characteristics of Tunnel Diode.	10M	2	3
6	A sinusoidal voltage whose Vm=26V is applied to half-wave rectifier. The diode may be considered to be ideal and RL=1.2 KΩ is connected as load. Find out peak value of current, RMS value of Current, DC value of current and Ripple factor.	10M	3	
	OR			
7	a) Derive the expression for Ripple factor and Efficiency for Full Wave Rectifier. b) Compare FWR and Bridge rectifier.	6M 4M	3	2
8	a) The reverse leakage current of the transistor when in CB configuration is 0.3μA while it is 16μA when the same transistor is connected in CE configuration. Determine α, β and γ. b) Discuss the base width modulation.	6M 4M	4	3
	OR			
9	a) Explain input and output characteristics of transistor in CC configuration with neat diagram. b) The common base DC current gain of a transistor is 0.967. If the emitter current is 10 mA, what is the value of base current and collector current.	6M 4M	4	2
10	Illustrate the construction and principle of operation of JFET with necessary diagrams.	10M	5	3
	OR			
11	Describe the construction and working principle of Enhancement mode and depletion mode MOSFET and draw its characteristics.	10M	5	2