R25 Regulation *Subject code:5ES2AL*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech II Semester Regular Examinations, June 2026

SEMICONDUCTOR DEVICES AND CIRCUITS

(ECE)

Maximum Marks: 60 Date:26.06.2026 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 (5X2M=10Marks)		Marks	CO	BTL
1.a	What is difference between Zener breakdown and avalanche breakdown.	2M	1	1
b	Mention the peak inverse voltage (PIV) across each diode in a bridge Rectifier and half wave rectifier.	2M	2	1
c	Determine collector current (I_C) of a BJT with β=100, I_B=0.1μA, I_{CEO}=10μA.	2M	3	1
d	Why is biasing necessary in transistor amplifiers?	2M	4	1
e	Why is FET called a voltage-controlled device?	2M	5	1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
2	Explain the V-I characteristics of a Tunnel Diode with neat energy band diagrams and sketches. Also explain the negative resistance region and principle of operation of the tunnel diode.	10M	1	2
	OR			
3	a) Describe the operation of a PN junction diode under open-circuit, forward-bias, and reverse-bias conditions with neat and suitable diagrams. b) Determine the values of forward current in the case of a PN junction diode with IO=10μA, Vf=0.8V at T=300K. Assume Si diode.	7M 3M	1	2
4	Draw the Bridge rectifier circuit & explain its operation with waveforms. Derive the expression for efficiency and ripple factor.	10M	2	2
	OR			
5	In a full wave rectifier, the voltage applied to each diode is 240 sin 377t, the load resistance is R_L=2000Ω and each diode has a forward resistance of 400 Ω. Calculate ripple factor, efficiency PIV and output ripple frequency.	10M	2	2

6	With the help of neat sketches discuss the input and output characteristics of CE configuration.	10M	3	2
	OR			
7	a) Derive the relationship between α, β and γ of a bipolar junction transistor. b) Explain the transistor current components in a bipolar junction transistor (BJT) with suitable diagrams.	5M 5M	3	2
8	A germanium transistor with $\beta = 50$, $V_{CC} = 16$ V & $R_C = 1.5K\Omega$ is used in self bias circuit. It is desired to establish a Q point at $V_{CE} = 8V$, $I_C = 4mA$ and a stability factor S =10.Find R_E, R_1 & R_2.	10M	4	3
	OR			
9	Analyze and compare the fixed bias, collector-to-base bias, and self-bias circuits based on stability, configuration, and performance characteristics.	10M	4	3
10	Explain the drain and transfer characteristics of an enhancement-type MOSFET (EMOSFET) with neat sketches and discuss its operation.	10M	5	2
	OR			
11	Explain the working principle and operating characteristics of JFET with neat diagram.	10M	5	2