R22 Regulation *Subject code: E121PC1*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

M.TECH I Semester Regular/Supplementary Examinations, March 2025

ADVANCED POWER ELECTRONIC CONVERTERS-I

(POWER ELECTRONICS)

Maximum Marks: 60 Date:10.03.2025 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)		CO No.	BTL
1.a)	Define the working principle of MOS Turn-off Thyristor (MTO).	1	L1
b)	Compare MOSFET and IGBT in terms of switching speed and efficiency.	1	L1
c)	What are power factor improvement techniques in converters?	2	L1
d)	What is a three-phase dual converter? Where is it used?	2	L1
e)	What is the principle of operation of a PWM inverter?	3	L1
f)	What is the differentiate between Multiple PWM and Sinusoidal PWM.	3	L1
g)	What are the advantages of space vector modulation (SVM)?	4	L1
h)	What are the differences between single-phase and three-phase inverters?	4	L1
i)	What is a diode-clamped multilevel inverter?	5	L1
j)	What are the main applications of multilevel inverters?	5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)		CO No.	BTL
2	Explain the structure, working principle, and characteristics of Insulated Gate Bipolar Transistor (IGBT). How does it compare with MOSFET? (10M)	1	L2
	OR		
3	Compare different modern power semiconductor devices in terms of switching characteristics, efficiency, and applications. (10M)	1	L2
4	Explain the working of three-phase fully controlled rectifiers and analyze their performance parameters. (10M)	2	L2
	OR		
5	What are twelve-pulse converters? Discuss their advantages and applications in power electronics. (10M)	2	L2
6	How does phase displacement control improve the performance of PWM inverters? Explain with necessary diagrams. (10M)	3	L2
	OR		

7	Discuss the applications of PWM inverters and their advantages in modern power electronic systems. (10M)	3	L2
8	Compare the 120-degree and 180-degree conduction modes of a three-phase inverter. Which one is preferred and why? (10M)	4	L2
	OR		
9	What is Third Harmonic Injection PWM? Explain how it reduces harmonic distortion in inverters. (10M)	4	L2
10	How does a flying capacitor multilevel inverter work? Compare its performance with a cascaded multilevel inverter. (10M)	5	L2
	OR		
11	Explain the significance of DC link capacitor voltage balancing in multilevel inverters. How can it be achieved? (10M)	5	L2