R22 Regulation *Subject code: E121PC2*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

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

ELECTRICAL DRIVES

(Power Electronics)

Maximum Marks: 60 Date:12.03.2025 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)	Differentiate single-phase semi-converter and a single-phase full converter?	1	L1
b)	What type of DC motor is commonly used in rectifier-controlled drives?	1	L1
c)	Which **semiconductor device** used in modern chopper circuits.	2	L1
d)	What is the main **input source** for a chopper in a DC motor drive?	2	L1
e)	List out the applications of open-loop system?	3	L1
f)	What is meant by voltage fed inverter	3	L1
g)	What are the advantages of direct vector control?	4	L1
h)	What are the two main components of a self-tuning regulator?	4	L1
i)	Classify main types of control strategies used in synchronous motors?	5	L1
j)	Define unity power factor?	5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)		CO No.	BTL
2	a) Describe the working of a single-phase full-wave controlled rectifier with a DC motor load. (5M)	1	L2
	b) Discuss the steady-state performance of a three-phase controlled rectifier-fed DC motor drive. (5M)	1	L2
	OR		
3	a) Explain the importance of current feedback in a DC drive. (5M)	2	L2
	b) Discuss the role of a current reference generator in a closed-loop DC motor control system. (5M)	2	L2
4	a) Compare the use of IGBTs, MOSFETs, and thyristors in chopper circuits for DC motor drives. (5M)	3	L2
	b) Explain different input voltage sources used in chopper circuits? (5M)	3	L2
	OR		
5	a) Discuss the working principle of a pulse-width modulated (PWM) current controller used in chopper-controlled drives. (5M)	3	L2
	b)Explain the importance of Hysteresis current controller in chopper controlled DC drive? (5M)	4	L2

6	a) Discuss speed torque characteristics with variable voltage operation ? (5M)	4	L2
	b) Explain the concept of slip power recovery in induction motor drives. (5M)	4	L2
	OR		
7	a) Explain about the Speed control of Kramer Drive (5M)	5	L2
	b) Define slip and its significance in induction motor speed control. (5M)	5	L2
8	a) Explain the fundamental concept of vector control in AC motors. How does it improve performance compared to scalar control (5M)	1	L2
	b) Explain about the adaptive control principles. (5M)	1	L2
	OR		
9	a)What are the advantages and disadvantages of direct and indirect vector control? (5M)	2	L2
	b) Explain the principle of Direct Torque Control (DTC)? (5M)	2	L2
10	a) Explain Constant mutual flux linkage control of a Permanent Magnet Synchronous Motor drives? (5M)	2	L2
	b) Explain the working principle of a Permanent Magnet Synchronous Motor drive? (5M)	3	L2
	OR		
11	a) How does torque angle control impact the overall performance and efficiency of the PMSM? (5M)	3	L2
	b) Describe the closed-loop control structure of a Permanent Magnet Synchronous Motor drive. (5M)	4	L2