R22 Regulation *Subject code: 4E7BA*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech VII Semester Supplementary Examinations, May 2026

Electric Drives

(EEE)

Maximum Marks: 60 Date:15.05.2026 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 (10X1M=10 Marks)		Marks	CO	Bloom Tx
1.a)	Write any one application of three-phase rectifier controlled fed DC series motor drive.	1M	1	BO1
b)	Draw-speed torque characteristics of 1-phase fully controlled rectifier fed DC series motor drive.	1M	1	BO2
c)	Define Regenerative braking.	1M	2	BO1
d)	Which type of semiconductor switches are generally employed in chopper-controlled DC motor drives.	1M	2	BO2
e)	Write at least one advantage PWM controlled induction motor drive,	1M	3	BO1
f)	Draw the circuit diagram of CSI fed induction motor drive.	1M	3	BO2
g)	Write any one limitation of cycloconverter fed induction motor drive/	1M	4	BO1
h)	Write the application of rotor resistance control.	1M	4	BO1
i)	What in the range of α for the load side converter in a self-controlled synchronous motor drive?	1M	5	BO1
j)	How permanent magnet synchronous motor differs from synchronous motor?	1M	5	BO2

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	Bloom Tx
2	Describe the operation of a separately excited dc motor when it is supplied from a single-phase half-controlled rectifier. Draw and explain its current and voltage waveforms for continuous conduction.	10M	1	BO2
	OR			
3	Explain the operation of dc separately excited motor fed from three phase fully controlled rectifier. Draw and explain its speed torque characteristics for continuous mode of operation.	10M	1	BO2
4	a) Explain the concept of four-quadrant operation in electrical drives and discuss how torque and speed polarity define each quadrant.	5+5	2	BO3

	b) Explain how a single-phase dual converter achieves forward motoring and forward regenerative braking.			
	OR			
5	a) A dc chopper is used in rheostat braking of a dc separately excited motor. The armature resistance is Ra=0.05 Ω. The braking resistor Rb = 5Ω. The back emf constant is Kb=1.52 V/A rad/sec. The average armature current is maintained constant at Ia = 150 A. The armature current is continuous and has negligible ripple. The field current is If = 1.5 A. If the duty cycle of the chopper is 40 %, find: (i) The average voltage of the chopper (ii) The power dissipated in the braking resistor b) Explain with circuit and waveforms of two quadrant chopper fed separately excited D.C. motor.	5+5	2	BO3 BO2
6	a) Discuss the operation of a VSI-fed induction motor drive under variable frequency control. b) A 2.8 KW, 400 V, 50 HZ, 4 pole, 1370 rpm star connected squirrel - cage induction motor has following parameters referred to the stator: R_s =1.9 Ω; R_r^1 =4.757 Ω; X_s =X_r^1 =3Ω, X_m = 80Ω. Load characteristics are matched with motor such that the motor runs at 1370 rpm with full voltage across its terminals. The motor is controlled by terminal voltage control and load torque is proportional to speed. Determine motor terminal voltage and current at half rated speed.	5+5	3	BO2
	OR			
7	a) Explain the principle of cycloconverters used for variable frequency control of induction motors. b) With a neat block diagram, explain closed-loop speed control of induction motor drives.	5+5	3	BO2 BO3
8	Explain the concept of slip power recovery scheme by Static-Schebius drive with neat circuit diagram. Draw the speed- torque characteristics.	10	4	BO4
	OR			
9	a) Why does the static Kramer drive has a low range of speed control? b) Explain how changing external rotor resistance affects the slip and torque of an induction motor.	5+5	4	BO2
10	Describe the speed-torque characteristics of a load-commutated synchronous motor. How do they differ from voltage source inverter (VSI) drives?	10	5	BO2
	OR			
11	Describe the operation of a self-controlled synchronous motor using a Voltage Source Inverter (VSI).	10	5	BO3