Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Seventh Semester B.Tech Degree Examination December 2022 (2019 scheme)

Course Code: EET413

Course Name: ELECTRIC DRIVES

Max. Marks: 100 **Duration: 3 Hours**

Graph paper to be supplied if necessary

PART A

Answer all questions, each carries 3 marks. Marks

1		List out the merits and demerits of an electric drive.	(3)
2		Distinguish between passive and active torques with examples.	(3)
3		Draw the circuit diagram of a three-phase semi-converter fed drive for a separately excited DC motor	(3)
4		Summarize the armature voltage control and field weakening mode control of a DC motor drive	(3)
5		Draw the circuit diagram of a class-D chopper-fed DC series motor. Sketch its V-I characteristics.	(3)
6		Derive the speed equation for regenerative braking of chopper-fed DC drives.	(3)
7		Why stator voltage control is not suitable for speed control of induction motors with constant load torque?	(3)
8		Mention the advantages of rotor resistance control of induction motor.	(3)
9		Explain the Park's transformation.	(3)
10		Explain the principle of field-oriented control.	(3)

PART B

Answer any one full question from each module, each carries 14 marks.

Module I

11	a)	What are the different types of load? Give examples for each type.	(6)
	b)	Explain the speed control of an electric drive with a suitable block diagram.	(8)

OR

12	a)	Explain the dynamics of Motor Load combination of an electric drive.	(6)
	b)	A motor is used to drive a hoist. Motor characteristics are given by	(8)

Quadrants I and II: $T_M = 200 - 0.2N$ N-m

Quadrants III and IV: $T_M = - 200 - 0.2N$ N-m

where N is the speed in rpm.

When the hoist is loaded, the net load torque T_L =100 N-m, and when it is unloaded, the net load torque is T_L = - 80 N-m. Obtain the equilibrium speeds for operation in all four quadrants.

Module II

13 With suitable circuit diagram and waveforms, explain the working of a three-phase full converter of a separately excited DC motor. (14)

OR

14 a) A 210 V, 1200 RPM, 10 A separately excited DC motor is controlled by a 1- phase fully controlled converter with an AC source voltage of 230V, 50 Hz. Assume that sufficient inductance is present in the armature circuit to make the motor current continuous and ripple free for any torque greater than 25% of rated torque. Ra = 1.5 Ω What should be the value of the firing angle to get the rated torque at 800 rpm? Compute the firing angle for the rated braking torque at -1200 rpm. Calculate the motor-speed at the rated torque and $\alpha = 165^0$ for the regenerative braking in the second quadrant? (8)

b) Summarize the working of a single-phase full converter with suitable waveforms and circuit diagram. (6)

Module III

15 Explain the working of a class E chopper fed separately excited DC Motor with a suitable circuit diagram (14)

OR

16 a) A 220 V, 24A, 1000 RPM, DC separately excited motor has an armature resistance of 2 Ω. The motor is controlled by a Chopper with a frequency of 500 Hz from a supply of 230 V. Calculate the duty ratio δ for 1.2 times the rated Torque and 500 RPM. (7)

b) Explain the operation of a class C chopper fed separately excited DC motor with suitable waveforms and diagram. (7)

Module IV

17 a) Summarize the functioning of stator V/f control fed induction drive (7)

b) Explain the principle of operation of a static Kramer system with a suitable circuit diagram. (7)

OR

18 a) Explain any three methods for obtaining variable output voltage from a voltage source inverter. (9)

b) Compare CSI-fed induction drive and VSI-fed induction drive (5)

Module V

19 Explain the working of field vector control fed induction drive with block diagram. (14)

OR

20 a) Explain the different modes of variable frequency control of a synchronous motor drive. (6)

b) Explain the working of self-controlled SM drive employing load commutated thyristor inverter. (8)

****