Roll No. | | | | | | | | | | |

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E. / B. Tech / B. Arch (Full Time) - END SEMESTER EXAMINATIONS, APR/MAY 2024

ELECTRICAL AND ELECTRONICS ENGINEERING
VII Semester

EE5701 & Electrical Drives

(Regulations 2019)

Time: 3hrs

Max.Marks: 100

PART- A (10 x 2 = 20 Marks)
(Answer all Questions)

Q. No	Questions	Marks
1	Compare active and passive load torque.	2
2	Write the equation in connection with assessing the stability of an electric drive. .	2
3	What will be the ripple frequency of a single phase full converter and three phase full converter? Assume supply frequency is 60 Hz.	2
4	Define duty cycle in a step up chopper.	2
5	Why stator voltage control scheme employed for induction motor drives with high slip?	2
6	Write the features of current source driven AC drive.	2
7	Define slip power	2
8	Define super synchronous speed.	2
9	What are the benefits of synchronous motor drives?	2
10	Define load commutation.	2

PART- B (5 x 13 = 65 Marks)

Q. No	Questions	Marks
11 (a)	Explain the various duty cycles involved in assessing the rating of motors.	13
11 (b)	Explain the speed torque conventions involved in the multi-quadrant operation of a motor driving a hoist load.	13
12 (a)	Derive the necessary expression for critical speed calculation for single phase full converter fed separately excited DC motor.	13
	OR	
12 (b)	A 200 V, 875 rpm, 150 A separately excited dc motor has an armature resistance of 0.06 Ω. It is fed from a single phase fully-controlled rectifier with an ac source voltage of 220 V, 50 HZ. Assuming continuous conduction, calculate firing angle for rated motor torque and 750 rpm and -500 rpm.	13
13 (a)	Discuss the improvement of power factor in a rotor side control of an induction	13

	motor using necessary diagrams and phasor diagrams	
	OR	
13 (b)	Explain the working of three phase AC voltage controller fed three phase induction motor with necessary waveforms.	**13**
14 (a)	Explain self-control of a synchronous motor with necessary diagrams.	**13**
	OR	
14 (b)	Explain how V/f control can be implemented in a synchronous motor drive systems	**13**
15 (a)	Design a speed-controlled DC motor drive maintaining the field flux constant. The motor parameters and ratings are as follows $220\ V;\ 8.3\ A;1470\ \text{rpm};\ R_a = 4\ \Omega;J = 0.0607\ kg-m^2;\ L_a = 0.072\ H;$ $B_1 = 0.0869\ Nm/rad/sec;\ K_b = 1.26\ V/rad/sec$ The converter is supplied from 230 V, 3-phase AC at 60 Hz. The converter is linear and its maximum control input voltage is $\pm 10\ V$. The tachogenerator has the transfer function $G_w(s) = \frac{0.065}{1+0.002s}$. The speed reference voltage has a maximum of 10 V. The maximum current permitted in the motor is 20 A.	**13**
	OR	
15 (b)	Explain the closed loop operation of DC motor with PID controller.	**13**

PART- C (1 x 15 = 15 Marks)

(Q.No.16 is compulsory)

Q. No	Questions	Marks
16.	A drive has following parameters: J= 10 Kg-m^2, T = 100 - 0.1 N, N-m. Passive load torque T_l = 0.05 N, N-m. Where N is the speed in rpm. Initially the drive is operating in steady-state. Now it is to be reversed. For this, motor characteristic is changed to T = -100 - 0.1N, N-m. Calculate the time of reversal.	**15**