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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Sixth Semester B.Tech Degree (S, FE) Examination May 2024 (2015 Scheme)

Course Code: EE308

Course Name: Electric Drives

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries5 marks. Marks

1		What do you understand by steady state stability? With a suitable speed torque characteristics explain stable and unstable point.	(5)
2		Derive the speed torque characteristics of DC separately excited motor. Draw its speed torque characteristics for different cases.	(5)
3		With suitable circuit diagram, explain the operation of two quadrant chopper fed DC motor drive. Also plot the output voltage and current waveforms.	(5)
4		Explain v/f control of induction motor and why is it superior to stator voltage control of induction motor?	(5)
5		With the help of a block diagram explain the closed loop speed control of current source inverter fed induction motor drive.	(5)
6		What is space vector? What is its role in the speed control of induction motor drive?	(5)
7		Explain the operation of current regulated converter used in trapezoidal PMAC drive.	(5)
8		What are the different types of surface mounted permanent magnet motors?	(5)

PART B

Answer any two full questions, each carries10 marks.

9	a)	What are the different classifications of power modulators used in electric drive?	(5)
	b)	A motor when operating in quadrant I and II has the characteristic T = 400 -0.4N, Nm, where N is the speed in rpm. The load which is coupled to the motor is an active load with the characteristic, $T_l = \pm 200$ Nm. Calculate the motor speeds for motoring and braking operation in the forward direction. When the drive is operating in quadrant III and IV, motor has the characteristic, T = - 400 - 0.4N Nm. What will be the equilibrium speed in quadrant III?	(5)

10 a) Define passive and active load torques with examples. Draw the speed – torque curve of high speed hoist and compressor (5)

b) Derive the equation for speed in terms of torque of fully controlled rectifier fed separately excited DC motor in discontinuous mode and deduce the speed torque characteristics. (5)

11 a) With the help of a neat circuit diagram and , explain the motoring and braking mode of operation of three phase fully controlled rectifier fed separately excited DC motor. Also sketch the waveforms of voltage across armature and armature current. (10)

PART C

Answer any two full questions, each carries10 marks.

12 a) A 230 V, 900 rpm and 200 A separately excited dc motor has an armature resistance of 0.02Ω . The motor is fed from chopper which provides both motoring and braking operations. The source has a voltage of 230V. Assume continuous conduction. (i) Calculate duty ratio of chopper for motoring operation at rated torque and 300 rpm. (ii)Calculate duty ratio of chopper for regenerative braking operation at rated torque and 200 rpm. (5)

b) Explain Regenerative braking mode of operation of separately excited DC motor using step up chopper . Draw speed-torque curves for different values of duty ratio (5.)

13 a) With suitable circuit diagram and waveforms explain the operation of a cycloconverter to step up frequency from f_s to $4f_s$ (5)

b) Explain the closed loop static rotor resistance control of a slip ring induction motor. What are the disadvantages of this speed control method? (5)

14 a) Explain the static Kramer drive scheme for the speed control of a slip ring induction motor . How the firing angle control of thyristor bridge is done with constant motor field current? (6)

b) What is to be done to shift the operation of an inverter fed induction motor from motoring to braking mode? (4)

PART D

Answer any two full questions, each carries 10 marks.

15 a) Explain the difference between the VSI fed induction motor drive and CSI fed induction motor drive. (5)

b) Explain the operation of a self controlled synchronous motor drive employing load commutated inverter. (5)

16 a) Explain the frame transformation from three phase to synchronous reference frame. What is its significance in induction motor drive? (5)

b) In a variable frequency control of synchronous motor drive why v/f ratio is maintained constant upto base speed and V is constant above base speed. (5)

17 a) With block diagram, explain the operation of microcontroller based permanent magnet synchronous motor drives. (7)

b) What are the advantages of brushless dc motor over conventional dc motor? (3)

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