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**M.TECH
PEPC103**

1st Semester Regular/Back Examination – 2014
ELECTRIC DRIVES - I
BRANCH(S): POWER ELECTRONICS & DRIVES, POWER ELECTRONICS, POWER ELECTRONICS AND ELECTRICAL DRIVES
Time: 3 Hours
Max marks: 70
**Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.**

Q1		Answer the following Questions	(2x10)
	a)	What are the criteria for selection of drive components?	
	b)	What is the stability criteria of motor drives?	
	c)	How is saturation accounted for in dc machine modeling?	
	d)	How we select the shunt and series motor based on the torque and speed in particular application?	
	e)	What is the effect of increasing the chopping frequency on the transfer function of the chopper model?	
	f)	Why Chopper based D.C drives give better performance than rectifier controlled drives?	
	g)	What is soft start of induction motor?	
	h)	What are the main features of V/f control?	
	i)	Explain power inversion using chopper.	
	j)	What are the advantages of slip power recovery system?	

Q2	a)	How is power electronics converter chosen to match motor characteristics?	(5)
	b)	Explain the selection of power rating for dc drive motor with regards to thermal overloading and load variation factors	(5)

Q3		Derive the transfer function of the field flux controlled separately excited dc motor using a fully controlled rectifier in the field circuit.	(10)
		It has a non linear characteristic between the field current and field flux due to saturation of iron core in the stator and the rotor. How will this saturation affect the derived model of the dc motor?	

Q4	a)	Give the transfer function of four quadrant dc motor drives using phase controlled rectifier and explain its components.	(5)
	b)	A separately excited dc motor has 0.05 pu armature resistance and is fed from a three phase converter. The normalized voltage and flux are 1.0 pu. Draw the torque speed characteristics in the first quadrant for the constant delay angles of 0 , 30 and 60 degrees. Indicate the safe operating region if the maximum torque limit is 2.5 pu.	(5)

Q5	a)	A dc motor is driven from one quadrant chopper with a source voltage of 24V dc and at a frequency of 1 kHz. Determine the variation in duty cycle required to have a speed variation of 0 to 1 pu delivering a constant 2 pu load. The motor details are as follows: 1 hp,10V,2500 rpm,78.5% efficiency, Armature resistance is 0.01 Ω, Armature inductance is 0.002H, Motor voltage constant is 0.03819 V/rad/sec. Assume data suitably wherever necessary.	(5)
	b)	With the block diagram explain the closed loop operation of speed controlled dc motor chopper drive	(5)

Q6	a)	How will the PWM voltages, as compared to six step voltages, affect the torque pulsation both in magnitudes and in frequency?	(5)
	b)	With schematic circuit diagram explain the variable frequency CSI fed induction motor drives.	(5)

Q7	a)	Is there a need to limit the maximum value of firing angle α in the phase controlled induction motor drive? Explain.	(5)
	b)	Can a slip power controlled induction motor be reversed in speed? Explain how is it done.	(5)

Q8		Write short notes on any two:	(5 x 2)
	a)	Two quadrant dc motor drives with field weakening	
	b)	Four quadrant chopper circuit	
	c)	Impact of non sinusoidal excitation on induction motor drive	
	d)	Static Cramer drive	