PRN:		Course Code :	PPD102

First Year **M. Tech** End Semester Examination Winter 2024 000950

Modeling and Analysis of Electrical Machines

Day and Date: Fri 6 Dec 2024 Max Marks: **100**

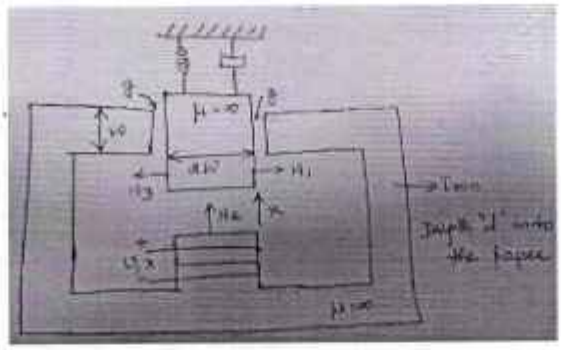
Time : 10:30AM To 01:30PM Duration: **03** hrs

Instructions: All questions are compulsory.

			Marks	Bloom's Level	CO
Q.1		**Attempt the following**			
	a)	Consider the three phase system which has the magnitude and frequency with 120 degree displacement. Find the variables in two phase reference frame. Derive the equation?	08	L6	CO1
	b)	Assume the salient pole machine and derive the rotor and stator self-inductance with suitable assumption and draw the wave form of inductance with respect to rotor angle?	08	L6	CO1
		OR			
	b)	Derive the voltage, current and power in power variant and power invariant transformation?	08	L6	CO1
Q.2		**Attempt the following**			
	a)	Derive the Separately Excited Motor Modeling from the generalized machine model?	08	L5	CO2
	b)	Differentiate the stator attached reference frame model of Squirrel cage induction motor and slip ring induction motor?	08	L5	CO2
		OR			
	b)	Derive the model of slip ring induction motor model from generalized machine model?	08	L5	CO2
Q.3		**Attempt any two from the following**			
	a)	The synchronous machine is having p number of poles. Write the speed matrix of the machine and derive the torque equation?	08	L5	CO3
	b)	Assume the surface mounted PMSM and derive the model of the same with suitable assumption?	08	L5	CO3
	c)	Explain the concept of vector control in PMSM for the salient pole rotor with suitable assumption?	08	L5	CO3
Q.4		**Attempt any two from the following**			
	a)	Justify the process of converting $\alpha\beta$ to DQ reference frame and its importance?	08	L4	CO2
	b)	With suitable derivation compare power invariant and non-power invariant transformation in three phase to two phase system?	08	L4	CO3
	c)	Derive the self and mutual inductance of Magnetic circuit using suitable assumption?	08	L4	CO4

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Q.5		**Attempt any Two of the following**			
	a)	Derive the expression for inductance effect of the circuit shown below?	09	L6	CO4



	b)	Assume the non-salient pole stator and rotor which has single winding each. Derive the self and mutual inductance equation of stator and rotor?	09	L6	CO4
	c)	Compare the torque equation of synchronous motor and PMSM motor and explain the factors which affect the torque of synchronous motor? Also derive the same torque equation using suitable assumption?	09	L6	CO4
Q.6		**Attempt any Two of the following**			
	a)	Derive the magnetic field intensity of rotor of the non-salient pole motor when the rotor only existed with single winding?	09	L5	CO2
	b)	Explain the induction motor speed control with details of rotor attached reference frame model control?	09	L5	CO3
	c)	Detail the vector control of Permanent Magnet Synchronous Motor with detailed block diagram?	09	L5	CO3

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