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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

January / February 2025 Semester End Main Examinations

Programme: B.E. **Semester: IV**

Branch: Electrical and Electronics Engineering **Duration: 3 hrs.**

Course Code: 19EE4PCMC1 **Max Marks: 100**

Course: ELECTRICAL MACHINES -I

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

			UNIT - I	*CO*	*PO*	Marks
1	a)		Illustrate with a phasor diagram, the operation of practical power transformer on load condition i) Capacitive load ii) resistive load	*CO1*	*PO4*	**10**
	b)		With the help of neat circuit diagrams describe OC and SC tests on single phase transformers.	*CO1*	*PO1*	**10**
			OR			
2	a)		With a neat sketch describe the open delta configuration of three phase transformer and list out its limitations.	*CO1*	*PO2*	**10**
	b)		A 3-phase step down transformer is connected to 6.6KV mains and it takes 10A. Evaluate for secondary line voltage, line current and output for the following connections. i) Delta-Star ii) Star-Delta. Assume turns ratio n=1/12 draw the connection diagram	*CO2*	*PO4*	**10**
			UNIT - II			
3	a)		Discuss the importance of parallel operation of two transformers and with a neat sketch describe the parallel operation of two single phase dissimilar transformer.	*CO2*	*PO1*	**10**
	b)		With a neat sketch ascertain the construction and working of autotransformer	*CO1*	*PO1*	**10**
			OR			
4	a)		Compare the copper requirement of an auto transformer and two winding transformer of same VA ratings	*CO2*	*PO1*	**10**
	b)		A 20 kVA, 440/220 V transformer with an equivalent impedance of 0.01 ohm is to operate in parallel with a 15 kVA, 440/220 V transformer with an equivalent impedance of 0.015 ohm. The two transformers are connected in parallel and made to carry a combined load of 25 kVA. Assume both the impedances to have the same angle.	*CO3*	*PO4*	**10**

B.M.S.C.E. ODD SEM 2024-25

			i) Find the individual load currents ii) What percentage of the rated capacity of each transformer is used.			
			UNIT - III			
	5	a)	Obtain the relationship between rotor input, rotor cu-losses and rotor power developed in a three-phase induction motor.	*CO2*	*PO1*	**6**
		b)	Draw the connection diagram of an auto transformer starter for a star connected three phase cage rotor induction motor. Obtain the expression for starting torque in terms of full load torque with auto transformer starter.	*CO2*	*PO3*	**7**
		c)	Draw the connection diagram of a star delta starter for a star connected three phase cage rotor induction motor. Obtain the expression for starting torque in terms of full load torque with star –delta starter	*CO2*	*PO3*	**7**
			OR			
	6	a)	Show the arrangement of rotor conductors in a double cage rotor motor. Sketch its torque –slip characteristics and explain its operation.	*CO2*	*PO7*	**10**
		b)	The induction motor tends to get over heated at reduced speeds in speed control by variation of supply voltage method." Justify the above statement with the help of relevant equations. List the drawbacks of speed control by variation of supply voltage method.	*CO2*	*PO3*	**10**
			UNIT - IV			
	7	a)	Elaborate the phenomenon of cogging and crawling in 3 phase induction motor.	*CO2*	*PO3*	**10**
		b)	With a neat sketch illustrate the no load and locked rotor test performed on a 3 phase induction motor. Write the equivalent circuit and mention all the parameters	*CO3*	*PO7*	**10**
			OR			
	8	a)	With the help of a neat sketch explain the construction and operation of a double cage induction motor. Also draw its toque slip characteristics.	*CO2*	*PO2*	**10**
		b)	A 3 phase, 400V, 50Hz, 4 pole induction motor has star connected stator winding. The rotor resistance and reactance are 0.1 Ω and 1 Ω respectively. The full load speed is 1440rpm. Determine the developed torque by the motor	*CO3*	*PO6*	**10**
			UNIT - V			
	9	a)	Discuss the deferent types of single-phase induction motor and their applications	*CO1*	*PO2*	**10**
		b)	List different methods of staring a single phase induction motor and explain any two methods	*CO1*	*PO2*	**10**
			OR			

B.W.S.C.E. ODD SEM 2024-25

	10	a)	Describe the Double revolving field theory and principle of operation of a single phase induction motor	*CO2*	*PO2*	**10**
		b)	A 220V, 6 pole, 50 Hz, single phase induction motor has the following equivalent circuit parameters as referred to the stator. Stator resistance and reactance R1= 3 Ohm, X1=5 Ohm, rotor resistance and reactance referred to the stator side R2' = 1.5 ohm and X2'= 2 ohm. Neglect the magnetizing current. When the motor runs at 97% of synchronous speed, compute the ratio of i) Forward induced stator EMF to backward induced stator EMF ii) Forward torque to backward torque	*CO3*	*PO6*	**10**

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B.M.S.C.E. - ODD SEM 2024-25