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

Autonomous Institute Affiliated to VTU

June 2025 Semester End Main Examinations

Programme: B.E.   **Semester: III**

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

Course Code: 22EE3PCTIM   **Max Marks: 100**

Course: Transformers & Induction Machines

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

			UNIT - I	CO	PO	Marks
1	a)		Explain polarity test in transformers.	CO1	PO2	**05**
	b)		Explain how the regulation and efficiency of a transformer can be pre-determined by indirect tests.	CO1	PO2	**07**
	c)		Why is it necessary to provide tapings on transformer windings? Describe no load tap changing. List its advantages and disadvantages.	CO1	PO2	**08**
			OR			
2	a)		With neat circuit diagram and equations, explain sumpner's Test.	CO1	PO2	**10**
	b)		Derive an expression for the saving of copper effected by using an auto transformer instead of a two winding transformer.	CO1	PO2	**10**
			UNIT - II			
3	a)		With neat circuit diagram and equation, explain parallel operation of a single phase transformer with necessary conditions for equal voltage ratio.	CO2	PO2	**10**
	b)		A three phase step down transformer is connected to 6600 volts mains and takes 10A. Determine the secondary line voltage, Line current and output for the following connections. i) Delta – Delta ii) Star – Star. Take turns ratio as 12.	CO2	PO2	**10**
			OR			
4	a)		With circuit diagram and phasor diagram explain open delta connection. Obtain the relationship between power transferred by V-V connected with that of Δ- Δ connected transformers	CO2	PO2	**10**

				CO2	PO2	10
		b)	With the help of circuit and Phasor diagram, explain how 2-phase supply can be obtained from 3-phase supply using Scott connection?			
			UNIT - III			
5		a)	A three-phase induction motor has a starting torque of 100% and maximum torque of 200% of the full load torque. Determine i) slip at which maximum torque occurs ii) full load slip	CO3	PO2	10
		b)	A 6 pole, three phase, 50Hz induction motor running on full load with 4% slip develops a torque of 149.3Nm, at its pulley rim. The friction and windage losses are 200W and stator copper and iron losses equal to 1620W. Determine i) output power ii) Gross torque iii) Rotor copper loss iv) Efficiency.	CO3	PO2	10
			OR			
6		a)	Derive the torque equation of a three phase induction motor.	CO3	PO2	07
		b)	A three 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 1440 rpm. Determine the torque developed on full load by the motor. Assume stator to rotor ratio as 2:1.	CO3	PO2	07
		c)	Derive the condition for maximum torque.	CO3	PO2	06
			UNIT - IV			
7		a)	With neat circuit diagram, explain the necessity of conducting No-load and blocked rotor test on three phase induction motor. Also mention the mathematical relation.	CO3	PO2	10
		b)	What is the necessity of starter in a three-phase induction motor? With neat circuit diagram explain star-delta starter.	CO3	PO2	10
			OR			
8		a)	Draw the circle diagram for 5.5kW, 400V, 3-Ph, 50Hz, 4 pole slip ring IM from the test data given (line values) No load Test: 400V, 6A, 0.085 p.f lag Blocked rotor test: 100V, 12A, 700W The ratio of primary to secondary turns is 2.6 stator resistance/ph is 0.67Ω and that of rotor is 0.18 Ω. Calculate (i) FL current (ii) FL slip (iii) ratio of max torque to FL torque (Choose a current scale as 1cm=3A)	CO3	PO2	10
		b)	Draw the connection diagram of the star-delta starter for a three-phase induction motor. Give an expression for the ratio of starting torque to full load torque with star delta starter.	CO3	PO2	06

				CO	PO	
		c)	What are the parameters on which speed of a three-phase induction motor depends upon? List different methods of speed control of three phase induction motors	*CO3*	*PO2*	**04**
			UNIT - V			
9		a)	Why single-phase induction motor is not self-starting. Explain double revolving theory of single-phase induction motor.	*CO4*	*PO2*	**10**
		b)	With neat sketch, explain working of single-phase capacitor start and capacitor run induction motor.	*CO4*	*PO2*	**10**
			OR			
10		a)	Explain the principle of operation of a single-phase IM using double revolving field theory.	*CO4*	*PO2*	**10**
		b)	State double revolving field theory. How double revolving field theory can be applied to explain operation of single phase induction motors.	*CO4*	*PO2*	**10**

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