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

Autonomous Institute Affiliated to VTU

April 2024 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.

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)	A 6600/400V single phase transformer has primary resistance of 2.5ohms and secondary resistance of 0.01ohms. Calculate total equivalent resistance referred to primary and secondary	CO1	PO2	**04**
	b)	With the help of phasor diagram, explain the operation of single phase transformer on load at lagging and leading pf	CO1	PO1	**08**
	c)	The OC and SC test on a 5 KVA, 500/250V, 50 Hz single phase transformer gave the following results OC Test : 500 V, 1A, 50W (LV side open) SC Test : 25 V, 10A, 60W (LV side shorted) Calculate i) FL efficiency at 0.8 pf lag ii) Regulation at FL 0.8 leading.	CO1	PO2	**08**
		OR			
2	a)	A 600 KVA single phase transformer has an efficiency of 92% at both FL & half FL UPF; Determine the Efficiency at 75% of FL, 0.9Pf lag.	CO1	PO2	**07**
	b)	With a neat diagram explain Sumpner's test for determining the efficiency and voltage regulation of a transformer.	CO1	PO1	**07**
	c)	Derive an expression for the saving of copper in an autotransformer and also mention its advantages and applications.	CO1	PO1	**06**
		UNIT - II			
3	a)	Discuss the necessary conditions for parallel operation of transformers.	CO1	PO1	**04**
	b)	A 3-phase step down transformer is connected to 6600 volts mains and it takes 10A. Calculate the secondary line voltage, Line current and output for the STAR-STAR connection. Assume turns ratio/phase as 12 and draw the connection diagrams.	CO2	PO2	**08**
	c)	With the help of circuit and Phasor diagram, explain how 2-phase supply can be obtained from 3-phase supply using Scott connection?	CO2	PO2	**08**

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			UNIT - III			
	4	a)	Derive the equation for torque developed by the 3 phase Induction motor. Draw typical torque- Slip characteristics curve.	CO3	PO2	**07**
		b)	The power input to a 500V, 50Hz, 6 poles 3Φ IM running at a 975 rpm is 40Kw. The stator losses are 1Kw and Frictional & windage losses total are 2kW. Calculate (i) slip (ii) the rotor cu loss (iii) efficiency	CO3	PO2	**06**
		c)	Explain the phenomenon of Cogging and crawling in 3 phase Induction motor.	CO3	PO1	**07**
			OR			
	5	a)	With relevant sketches, explain the working principle of a 3-phase induction motor.	CO3	PO1	**08**
		b)	A 400 V, 4 pole, 3 phase, 50 Hz star connected IM has a rotor resistance and reactance per phase equal to 0.01 ohm and 0.1 ohm. Determine1.starting Torque 2. Slip at max torque occurs 3. Max Torque. Assume ratio of stator to rotor turns as 4.	CO3	PO2	**08**
		c)	List the advantages and applications of Induction generator.	CO3	PO1	**04**
			UNIT - IV			
	6	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)	Explain the following 1. speed control of 3-phase Induction motor by changing poles 2. DOL starter to start 3-phase Induction motor	CO4	PO2	**10**
			UNIT - V			
	7	a)	Explain the principle of operation of a single phase IM using double revolving field theory.	CO4	PO1	**10**
		b)	With a neat diagram, explain the working of shaded pole and Reluctance start single phase IM.	CO4	PO1	**10**

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