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

Autonomous Institute Affiliated to VTU

August 2023 Semester End Make-Up Examinations

Programme: B.E. **Semester: III**
Branch: Electrical & Electronics Engineering **Duration: 3 hrs.**
Course Code: 22EE3PCTIM **Max Marks: 100**
Course: Transformers & Induction Machines **Date: 11.08.2023**

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.

B.M.S.C.E.-M 2022-23

UNIT - I

1	a)	What is polarity test in transformers? Explain its need.	05
	b)	Explain how the voltage regulation and efficiency of a transformer can be pre-determined by indirect tests.	07
	c)	A 30kVA 2400/120 V transformer has HV winding resistance of 0.1Ω and leakage reactance of 0.22Ω. The LV winding resistance of 0.035Ω and leakage reactance of 0.012Ω. Calculate for the transformer (i) Equivalent resistance as referred to HV & LV winding (ii) Equivalent reactance as referred to HV & LV winding (iii) Voltage regulation at full load 0.8 pf lag and 0.8 pf lead	08

OR

2	a)	Derive an expression for the saving of copper in an autotransformer as compared to two winding transformer.	05
	b)	Explain with a neat sketch, the Sumpner's test on single phase transformer	07
	c)	A 5kVA, 500/250V, 50Hz transformer gave the following results: OC test: 500V, 1A, 50W HV side readings SC test: 25V, 10A, 60W LV side shorted Determine Circuit constants and draw the equivalent circuit	08

UNIT - II

3	a)	With a circuit diagram & phasor diagram explain open delta connection. Obtain the relationship between the power transferred by V-V connected with that of $\Delta - \Delta$ connected transformers.	06
	b)	Explain with necessary diagrams how two 1-phase transformers can be used to convert 3-phase supply to 2-phase supply.	06
	c)	Two transformers are connected in parallel to share a commom load of 100kVA at 0.8 lagging power factor. Their impedances in secondary terms are Z_A=(0.15+j0.5) Ω and Z_B =(0.1+j0.6) Ω. Find kVA load shared by each transformer. Which transformer takes more load. Show the connection diagram.	08

UNIT - III

4 a) Derive an expression for starting torque produced in three phase induction motor. **06**

b) Show that ratio of mechanical power developed to rotor copper loss is $\frac{1-s}{s}$ where s is the slip. **06**

c) An 18650W, 4 pole, 50Hz, 3-phase Induction Motor has friction and windage losses of 2.5 percent of the output. The full load slip is 4% **08**

Compute for full load

(i) the rotor copper loss
(ii) the rotor input
(iii) the shaft Torque

the motor efficiency if the stator copper loss is 2000W

OR

5 a) Explain the working of an induction generator with a neat sketch **06**

b) Draw the equivalent circuit for a 3-phase induction motor and explain how mechanical power developed is taken care in the equivalent circuit. **06**

c) A 746-kW, 3-phase, 50-Hz, 16-pole induction motor has a rotor impedance of (0.02 + j 0.15) Ω at standstill. Full-load torque is obtained at 360 rpm. **08**

Calculate

(i) the ratio of maximum to full-load torque
(ii) the speed of maximum torque
(iii)the rotor resistance to be added to get maximum starting torque
(iv) Ratio of starting torque to maximum torque

UNIT - IV

6 a) Explain with neat sketch the construction and working of star-delta starter. **06**

b) Explain the rotor resistance method of speed control with a neat circuit diagram **06**

c) A 3-phase, 400V, 14.9kW, 50 Hz star connected induction motor gave the following test readings (line value) **08**

No load: 400 V, 1250 W, 9A
Blocked rotor: 150 V, 4000 W, 38A
Stator copper loss is equal to rotor copper loss at stand still. Draw the circle diagram and estimate

i) Full load current
ii) Full load pf.
iii) Full load slip

UNIT - V

7 a) Explain the double field revolving theory as applied to single phase Induction Motor and prove that it cannot produce any starting torque. Also, explain how to make single phase induction motor self-start. **08**

b) Explain the working of a single value capacitor run induction motor. **06**

c) Draw the equivalent circuit of single-phase induction motor and explain **06**

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