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

Autonomous Institute Affiliated to VTU

December 2023 Supplementary Examinations

Programme: B.E. **Semester: III**
Branch: Electrical & 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

1	a)	Draw the vector diagram of a practical transformer on load supplying i) Unity power factor load ii) lagging power factor load	**06**
	b)	Define voltage regulation of a transformer? The Short circuit test data of a 5kVA, 400/100 V single phase transformer with 100 V winding shorted is as follows: Vs = 400V, Ws = 250 W at rated current. Estimate approximate voltage regulation of the transformer at unity power factor.	**08**
	c)	Why is it necessary to provide tapings on transformer windings? Describe no load tap changing. List its advantages and disadvantages.	**06**

OR

2	a)	Suggest a suitable method to test single phase transformers under fully loaded conditions without using any load resistance. Describe the procedure of the test with the help of a circuit diagram. Explain how to use the test data.	**10**
	b)	Show the copper saving in a auto transformer in comparison with a two winding transformer	**06**
	c)	A 100 kVA, 11kV/220V, 50 Hz transformer gave the following OC test data: 220V, 45 A, 2000 W. Find the components of the no load current.	**04**

UNIT - II

3	a)	Show the circuit arrangement for three phase to two phase conversion using two transformers. Show that the currents on the three phase side is balanced if the two phase side is balanced	**08**
	b)	Show that in a open delta connection (V-V), the rating of the bank is 13.4 % less than the sum of the individual ratings of the transformer	**06**
	c)	Two single phase transformers of equal turns ratio, have impedances of (0.5+i3) Ω and (0.6 +j10)Ω with respect to secondary. If they operate in parallel determine how they will share a total load of 100kW at 0.8 pf lagging.	**06**

UNIT - III

4	a)	Obtain the relationship between rotor input, rotor copper losses and rotor power developed in a three phase induction motor.	**06**
	b)	Explain about causes, effect and remedy of cogging and crawling in three phase induction motors	**06**
	c)	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	**08**

OR

5	a)	Obtain the relationship between i) full load torque and maximum torque ii) starting torque and maximum torque of a three phase induction motor.	**06**
	b)	Explain the operation of Induction generator	**06**
	c)	A 1200 V, 50 Hz, star connected induction motor has a star connected slip ring rotor with a transformation ratio of 3.75. The rotor resistance per phase is 0.016 Ω and leakage inductance of 0.8 mH per phase. Neglect stator impedance. Calculate i) Rotor standstill EMF per phase ii) Rotor starting current per phase iii) Rotor current at 4% slip iv) rotor power factor at 4% slip.	**08**

UNIT - IV

6	a)	A three phase 400V induction motor gave the following test results: No load test: 400 V, 1250 W, 9A. Short circuit test: 150 v, 4kW, 38 A. Construct the circle diagram showing step by step calculations. If the full load power is 15.12 kW, find from the circle diagram i) current ii) Power factor iii) slip at full load.	**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.	**06**
	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.	**04**

UNIT - V

7	a)	State double revolving field theory. How double revolving field theory can be applied to explain operation of single phase induction motors.	**10**
	b)	Explain the working of i) Capacitor start single phase IM ii) Capacitor Run single phase IM iii) Capacitor start and run single phase IM	**10**

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