BACHELOR OF ENGINEERING (ELECTRICAL ENGINEERING) EXAMINATION, 2024

(3rdYear, 1st Semester)

ELECTRICAL MACHINES – II

Time : Three Hours | Full Marks : 100

(50 marks for each part)

Use a separate Answer Script for each part

PART – I

Answer any three questions.

Two marks are for well organized answers.

1.(a) "A rotating magnetic field of constant amplitude can be produced by supplying a balanced three phase voltage source to a balanced three phase winding" -- Explain. Find out the speed of the rotating magnetic field produced.How can you change the direction of the rotating magnetic field? 12

(b) Explain the principle of operation of a three phase induction motor. Why this type of motor is known as asynchronous motor? 4

2.(a) Starting from basic principle develop the expression for torque produced in a three phase induction motor. Establish the condition for maximum torque developed. Draw torque vs. slip characteristic and also show how torque vs. slip characteristic changes with the variation of rotor resistance and rotor inductance. 10

(b) The maximum torque of a 3-phase induction motor occurs at a slip of 12%. The motor has an equivalent secondary resistance of 0.08 ohm/phase. Calculate the equivalent load resistance R_L, the equivalent load voltage V_L and the current at this slip, if the gross power output is 9,000 watts. 6

3.(a) Develop equivalent circuit of a polyphase induction motor stating the assumption(s) taken and also develop its approximate equivalent circuit for the ease of calculation. 8

(b) Describe no-load and blocked rotor tests of an induction motor and calculate the equivalent circuit parameters from these test results. 8

4. Why starters are necessary for starting an induction motor? What are the various types of starters used for starting of squirrel cage induction motor? Describe with circuit diagram the working of any one type of starter for starting squirrel cage induction motor and hence derive an expression for starting torque in terms of full-load torque. 16

5.(a) Describe the construction of a double cage induction motor and explain how high starting torque is developed in double cage induction motor. Draw the equivalent circuit of double cage rotor induction motor. 10

(b) Describe briefly the phenomenon of cagging and crawling? What measures can eliminate these effects? 6

Ref No. : **Ex/EE/5/T/313/2024**

Bachelor of Engineering (Electrical Engineering) Third Year First Semester Exam, 2024

SUBJECT: ELECTRICAL MACHINES-II

Time: Three Hours

Full Marks: 100 (50 each part)

Use a separate Answer-Script for each part

Question No.	PART - II	Marks
	Answer question no. 1 and any two from the rest	
1.	Correct and/or justify any five from the following (any Five)	**4x5 = 20**
(i)	The 3-phase transformer banks are used in power plants inside tunnel.	
(ii)	If the per-unit impedance of two transformers are equal, they can be connected successfully in parallel.	
(iii)	Tertiary windings can be used for tap changes as well.	
iv)	The cross section of the central limb of a shell type transformer is usually designed to have larger cross section to avoid flux saturation.	
(v)	The $9n^{th}$ harmonics are always in phase though the $7n^{th}$ harmonics have a reversed phase sequence compared to fundamental.	
(vi)	Lumped parameter model must not be considered while studying impulse on a transformer.	
2.(i)	Write any two reasons for which the harmonics cannot be avoided in transformers.	**5+5+5**
(ii)	What is V-v connection? How is it different from Delta-delta connection?	
(iii)	How core construction help in reducing harmonics in a three phase transformer?	

Question No.		Marks
3.(i)	Draw and explain the connection used for three phase to two phase conversion from using two single phase transformers.	6 + 9
(ii)	In Scott-connected transformers, teaser transformer supplies 0.75 leading power factor load of 80 kW at 110 V and main transformer supplies 0.65 power factor lagging load of 110 kW at 220 V, from a three phase input line voltage of 11000V. Determine the input line currents. Neglect magnetizing currents and the leakage impedance drops. Draw voltage and current phasors computed.	
4.(i)	What is the significance of relative phase displacement in a three phase transformer?	3+3+9
(ii)	What are the underlying assumptions for making phasor group connections?	
(iii)	Draw the connection diagram and phasor diagram of the following connections. a) Yz11 , b) Dz0 , c) Dy1	
5.	Write Short notes on	7.5x2
(i)	Reactor-type On-load Tap-changers	
(ii)	Development of voltage stress along the winding of a three phase transformer for impulse and RMS voltages and the measure to be taken to withstand it.	