

Bachelor of Electrical Engineering(Evening) Examination, 2018

(3rdYear, 1stSemester)

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 neatness and well-organised answer.

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| 1. | a) Show that a rotating magnetic field of constant magnitude can be produced by supplying a balanced three phase winding from a balanced three phase voltage source. What happens if the phase sequence is reversed? | 10 |
| | b) Derive an expression for torque produced in a three phase induction motor. | 6 |
| 2. | a) Develop equivalent circuit of a polyphase induction motor stating the assumption(s) made 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 |
| 3. | a) A 440 volt, 3-phase, 50 Hz, 4-pole, Y-connected induction motor has a full load speed of 125 rpm. The rotor has an impedance of $(0.4 + j4)$ ohm and rotor/stator turn ratio of 0.8. Calculate (i) full load torque (ii) rotor current and full load rotor Cu-loss (iii) power output if windage and friction losses amount to 500 Watt (iv) maximum torque and speed at which it occurs (v) starting current and (vi) starting torque. | 8 |
| | b) A 400 volt, 4-pole, 3-phase, 50 Hz induction motor has a rotor resistance and reactance per phase of 0.01 ohm and 0.1 ohm respectively. Determine (a) maximum torque in N-m and the corresponding slip (b) the full load slip and power output in watts, if maximum torque is twice the full load torque. The ratio of stator to rotor turns is 4. | 8 |
| 4. | a) 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. | 10 |

[Turn over

	b) Describe briefly the phenomenon of cogging and crawling? What measures can eliminate these effects?	6
5.	a) Explain how improved starting performance of three phase squirrel cage motors may be obtained by means of double cage rotor winding. Draw the equivalent circuit of double cage induction motor.	10
	b) In a double cage induction motor, if the outer cage has an impedance at standstill of $(2 + j 1.2)$ ohms, determine the slip at which the two cages develop equal torques if the inner cage has an impedance of $(0.5 + j 3.5)$ ohms at standstill.	6

B.E. ELECTRICAL ENGINEERING (PART TIME), 3RD YEAR 1ST SEMESTER EXAM, 2018

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.	Answer any six from the following	3x6 = 18
(i)	Star – Delta connection can be used in a transformer to introduce a phase difference of 30° between its output and corresponding input line voltages but star-star cannot be used for the same. – Justify.	
(ii)	Compare the magnetic circuits in 3-ph shell type and 3-ph core type transformers.	
(iii)	All the 9 th harmonics of current will be in phase in a three phase transformer- justify.	
iv)	Taps are generally provided on the HV winding of a transformer – justify.	
(v)	The magnetizing current required for the phase coil in the central limb of a core type three phase transformer is the minimum. - Explain	
(vi)	Explain why a Dy1 transformer cannot be connected in parallel with a Dd0 transformer.	
(vii)	What are different probable causes of transient on transformers?	4+4+8
2.i)	Write down a few advantages of tertiary winding in a three phase transformer.	
ii)	Draw the equivalent circuit of a transformer having tertiary winding.	
iii)	Turns ratio of a three winding transformer is 4:2:1. A resistor of 10Ω is connected across winding 2. And a capacitor of reactance 2.5Ω is connected across winding 3. Estimate the winding 1 current if it is excited by 400V supply. Also draw the phasor diagram.	

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Question No.	PART - II	Marks
3. i)	Draw the connection diagram and phasor diagram of the following connections.	9 + 7
	a) Dy1 , b) Dz6, c) Yz11	
	ii) How Yd1 and Yd11 transformer can be connected in parallel?	
4. i)	Draw a diagram for the connection used for conversion of three-phase to two-phase.	4 + 12
	ii) In Scott-connected transformers, teaser transformer supplies 0.75 power factor load of 50 kW at 220 V and main transformer supplies 0.85 power factor lagging load of 40 kW at 220 V, from a three phase input line voltage of 3300V. Determine the input line currents. Neglect magnetizing currents and the leakage impedance drops. Draw voltage and current phasors computed.	
5.	Write short notes on :	8 + 8
	i) On load tap changer	
	ii) Development of voltage stress along the HV winding of a three phase transformer for impulse voltage and the measure to be taken to withstand it.	