Roll No. | | | | | | | | | | |

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E. / B. Tech / B. Arch (Full Time) - END SEMESTER EXAMINATIONS, APR/MAY 2025

ELECTRICAL AND ELECTRONICS
V Semester
EE5501 & Electrical Machines II
(Regulation 2019)

Time: 3hrs Max.Marks: 100

CO 1	Understand the concepts of windings, MMFs and rotating magnetic fields
CO 2	Understand the operation of ac machines
CO 3	Analyse the performance characteristics of ac machines
CO 4	Analyse the starting and speed control of ac machines
CO 5	Understand the field applications of ac machines

BL – Bloom's Taxonomy Levels
(L1 - Remembering, L2 - Understanding, L3 - Applying, L4 - Analysing, L5 - Evaluating, L6 - Creating)

PART- A (10 x 2 = 20 Marks)
(Answer all Questions)

Q. No	Questions	Marks	CO	BL
1	Define winding factor	2	CO1	L1
2	What are the drawbacks of concentrated winding?	2	CO1	L1
3	Why Single phase induction motor is not self-starting?	2	CO2	L2
4	Mention the value of torque of an induction motor at synchronous speed.	2	CO2	L2
5	A 3-phase, 6 pole induction motor is connected to 400 V, 50 Hz supply. Determine: . (i) Actual speed of the motor when running at 2% slip (ii) Frequency of emf induced in rotor	2	CO3	L2
6	Write the relationship to find the value of maximum torque in an induction motor.	2	CO3	L2
7	What is the need for starter for three phase induction motor?	2	CO4	L1
8	Mention different speed control methods of three phase slip ring induction motor.	2	CO4	L1
9	What are the applications of Synchronous motors?	2	CO5	L1
10	Define hunting.	2	CO5	L1

PART- B (5 x 13 = 65 Marks)

Q. No	Questions	Marks	CO	BL
11 (a)	Determine the distribution and coil span factor of a 4-pole, 3-phase alternator having 36-slots which carries a short-pitched winding with a span of 8 slots. Derive the expressions used.	6+7	CO1	L4
	OR			
11 (b)	A three-phase, 16 pole, 50 Hz star connected alternator has 144 slots and 10 conductors per slot. The flux per pole is $2{\cdot}48 \times 10^{-2}$ weber sinusoidally distributed. The coil pitch is 2 slots short of full pitch. Find (i) speed (ii) line emf	6+7	CO1	L4
12 (a)	Explain double field revolving theory with necessary equations and graphs.	13	CO2	L3
	OR			
12 (b)	Prove that analytically and graphically, a rotating magnetic field is	13	CO2	L3

	generated with a three phase winding supplied by a three phase source.			
13 (a)	(i) A 3-phase induction motor has a 4-pole star-connected stator winding. The motor runs at a line voltage of 200 V, 50 Hz supply. The rotor resistance and standstill reactance per phase are 0.1 and 0.9 ohm respectively. The ratio of rotor to stator turns is 0.67. Calculate the total torque at 4% slip. (ii) The rotor resistance and standstill rotor reactance of a 3-phase, 4-pole, 50 Hz, phase-wound induction motor is 0.21 ohm and 0.7 ohm per phase respectively. Calculate the speed at which maximum torque is developed.	**7+6**	CO3	L4
	OR			
13 (b)	A 440 V, 50 Hz, 4-pole, 3-phase, star-connected induction motor running at 1440 rpm on full load has a slip ring rotor of resistance 0·01 ohm and standstill reactance of 0·167 ohm, per phase. Calculate (i) the ratio of standing torque to maximum torque (ii) the ratio of maximum torque to full load torque.	**7+6**	CO3	L4
14 (a)	Derive the performance parameters of single phase induction motor through its equivalent circuit.	**13**	CO3	L4
	OR			
14 (b)	Explain the various starting methods of single phase induction motor.	**13**	CO4	L3
15 (a)	A single-phase 100 kVA, 600V, 50 Hz alternator has effective armature resistance and leakage reactance of 0·072 and 0·18 ohm respectively. At rated terminal voltage and kVA load, determine the internal induced emf at (i) unity p.f. (ii) 0·75 p.f. lagging; (iii) 0·75 p.f. leading.	**4+4+5**	CO2	L3
	OR			
15 (b)	Explain 'V' and inverted 'V' curves of synchronous motor.	**13**	CO5	L3

PART- C (1 x 15 = 15 Marks)

(Q.No.16 is compulsory)

Q. No	Questions	Marks	CO	BL
16.	The following readings were obtained when no-load and blocked rotor tests were performed on a 3-phase, 400 V, 14.9 kW induction motor: No-load test: 400 V, 1250 W, 9 A Blocked rotor test: 150 V, 4000 W, 38 A Find full-load current and power factor of the motor using circle diagram.	**7+8**	CO3	L5