Reg.No.:												

VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN

[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]

Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 80025

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – JAN. 2025

Fourth Semester

Electrical and Electronics Engineering

U19EE411 - AC MACHINES

(Regulation 2019)

Time: Three Hours | Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 – Evaluating
	K2 – Understanding	K4 – Analyzing	K6 – Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	Why a 3-phase synchronous motor will always run at synchronous speed?	2	K1	CO1
2.	Infer the criteria to be satisfied for the parallel operation of the alternators.	2	K1	CO1
3.	Show the two fundamental characteristics of a rotating magnetic field.	2	K1	CO2
4.	How the synchronous motor can be used as synchronous condenser?	2	K2	CO2
5.	Why is it objectionable to start large three phase induction motor by switching it directly on the line?	2	K1	CO3
6.	State the merits and demerits of double squirrel cage induction machines.	2	K2	CO3
7.	List the advantages of rotor resistance starter based induction motor starting.	2	K1	CO4
8.	Illustrate the advantages and disadvantages of V/F speed control of an induction motor.	2	K1	CO4
9.	Distinguish the terms rotating and pulsating magnetic fields.	2	K4	CO5
10.	What is the necessity of having laminated yoke in an ac series motor?	2	K1	CO5

PART – B

(5 x 13 = 65 Marks)

S.No.		Questions	Marks	KL	CO
11.	a)	i Define armature reaction and explain the effect of armature reaction on different power factor loads of synchronous generators.	6	K1	CO1
		ii Derive the EMF equation of a 3-phase synchronous machine.	7	K1	CO1
		(OR)			
	b)	Describe how the direct and quadrature-axis reactance of a salient-pole synchronous machine can be estimated by means of slip test.	13	K2	CO1
12.	a)	i Explain the features and principle of operation of three-phase synchronous motor.	8	K1	CO2
		ii List the advantages of salient pole in synchronous motor.	5	K1	CO2
		(OR)			
	b)	A 5kW, three-phase Y-connected 50 Hz, 440V, cylindrical rotor synchronous motor operates at rated condition with 0.8 pf leading. The motor efficiency excluding field and stator losses is 95% and Xs=2.5Ω. Calculate: i. Mechanical power developed ii. Armature Current iii. Back emf iv. Power angle v. Maximum or pull out torque of the motor.	13	K2	CO2
13.	a)	Illustrate and Explain the torque slip characteristics of 3 phase cage and slip-ring induction motors. Show the stable region in the graph.	13	K1	CO3
		(OR)			
	b)	Describe the following in detail: i. induction generator. ii. double cage rotor induction motors.	13	K2	CO3
14.	a)	Explain why starters are necessary for starting 3-phase induction motors. Name the different types of starters and explain autotransformer starter with neat diagrams.	3+10	K2	CO4
		(OR)			

b)	i.	The rotor resistance per phase of a 3-phas, 60 kW induction motor is 0.020 W. Design a starter for this induction motor having six notches, where the upper current limit has to be the full load current so that the slip is 2.5%.	6	K2	CO4
	ii.	Illustrate the rotor rheostat control of 3 phase slip ring induction motor.	7	K2	CO4
15. a)		Using double field revolving theory, compose why a single phase induction motor is not self-starting. Also obtain the equivalent circuit of single phase induction motor with necessary equations.	13	K2	CO5
		(OR)			
b)		Describe the construction and working principle of the following special machines: i. Stepper motors. ii. Universal motor.	13	K2	CO5

PART – C

(1 x 15 = 15Marks)

S.No.		Questions	Marks	KL	CO
16. a)	i.	Derive the expression for torque under running condition of a 3-phase induction motor and obtain the condition for maximum torque.	8	K2	CO3
	ii.	Compare squirrel cage induction motor with slipring induction motor.	7	K4	
		(OR)			
b)		Analyze various speed control methods of the three phase induction motor.	15	K4	CO4