Reg. No.																		

Question Paper Code	13000

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2024

Fourth Semester

Electrical and Electronics Engineering

20EEPC401 - SYNCHRONOUS AND INDUCTION MACHINES

Regulations - 2020

(Use of Graphs is permitted)

Duration: 3 Hours | Max. Marks: 100

PART - A (MCQ) (20 × 1 = 20 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	Alternators are also called Synchronous generators because (a) They must run at a constant speed irrespective of desired frequency. (b) They must run at synchronous speed to give the desired frequency (c) They must run at a speed which varies with frequency (d) They must run at a speed equal to the desired frequency.	1	K1	CO1
2.	For an Alternator connected to a load, the terminal voltage per phase will _____ (a) Be equal to the induced EMF (b) Constant irrespective of the load (c) Vary with the load (d) None of these	1	K1	CO1
3.	For a short pitch coil, the pitch factor is _____ (a) Less than 1 (b) Equal to 1 (c) More than 1 (d) Zero	1	K1	CO1
4.	For a single layer, 36 slot, four pole, four phase stator winding, the value of distribution factor is (a) 0.5 (b)0.96 (c) 0.4 (d) 0.2	1	K1	CO1
5.	For power factor correction, synchronous motors operate at (a) No load with over-excited fields (b) No load with under-excited fields (c) Normal load with minimum excitation (d)Normal load with zero excitation	1	K1	CO2
6.	If the field winding of an unloaded salient pole synchronous motor is open-circuited the motor will (a) Burn (b) Not start (c)Run as induction Motor (d)Run as variable reluctance motor	1	K1	CO2
7.	The speed regulation of a synchronous motor is (a) 100% (b) 50% (c) 25% (d) 0%	1	K1	CO2
8.	The negative phase sequence in a three phase synchronous motor exists when the motor is (a) Supplied with an unbalanced voltage (b) Supplied with an unbalanced load (c) Unbalanced system fault (d) All of the above	1	K1	CO2
9.	A three-phase slip ring induction motor is fed from the rotor side with the stator winding short-circuited. The frequency of the current flowing in the short-circuited stator is _____ (a) Slip frequency (b) Supply frequency (c) The frequency corresponding to rotor speed (d) Zero	1	K1	CO3
10.	An 8-pole, 3-phase, 50 Hz induction motor is operating at a speed of 720 rpm. The frequency of the rotor current of the motor in Hz is _____ (a) 2 (b) 4 (c) 3 (d) 1	1	K1	CO3
11.	In a 3-phase squirrel cage induction motor, skewing of rotor slots reduces (a) parasitic torque and noise but increases pull-out torque (b) parasitic torque and noise but increases starting torque (c) noise but increases pull-out torque and parasitic torque (d) parasitic torque, noise pull-out torque and starting torque	1	K1	CO3
12.	The frame of an induction motor is made of _____ (a) Aluminum (b) Silicon steel (c) Cast iron (d) Stainless steel	1	K1	CO3

13. The V/F control is a part of the synchronous speed changing technique. *1 K1 CO4*
(a) True (b) False
14. Regenerative is the best electrical braking among all braking techniques. *1 K1 CO4*
(a) True (b) False
15. In the rotor voltage injection method, when an external voltage source is in phase with the main voltage then speed will _____ *1 K1 CO4*
(a) Increase (b) Decrease (c) Remain unchanged (d) First increases then decrease
16. The value of slip at which maximum torque occurs _____ *1 K1 CO4*
(a) $R_2 \div X_2$ (b) $4R_2 \div X_2$ (c) $2R_2 \div X_2$ (d) $R_2 \div 3X_2$
17. In a split-phase motor, the running winding should have *1 K1 CO5*
(a) High resistance and low inductance (b) High resistance and High inductance
(c) Low resistance and high inductance (d) Low resistance and low inductance
18. If the capacitor of a single-phase motor is short-circuited *1 K1 CO5*
(a) The motor will not start
(b) The motor will run in the same direction at a reduced speed
(c) The motor will run in the reverse direction
(d) None of the above
19. To rque developed by a single-phase induction motor at starting is *1 K1 CO5*
(a) Less than the rated torque (b) More than the rated torque
(c) zero (d) None of the above
20. Which of the following motor will have a relatively higher power factor? *1 K1 CO5*
(a) Capacitor start motor (b) Shaded pole motor
(c) Capacitor run motor (d) Split phase motor

PART - B (10 × 2 = 20 Marks)

Answer ALL Questions

21. What are the conditions for parallel operation of an alternator? *2 K1 CO1*
22. List the various methods to determine the voltage regulation. *2 K1 CO1*
23. Why a 3 phase synchronous motor will always run at synchronous speed? *2 K1 CO2*
24. Differentiate synchronous and Induction machine. *2 K2 CO2*
25. Define slip of an Induction motor. *2 K1 CO3*
26. Define pullout torque. *2 K1 CO3*
27. Mention the different types of three phase Induction motor. *2 K1 CO4*
28. What is the need of starters? *2 K1 CO4*
29. Why the single phase induction motor is not self-starting? *2 K1 CO5*
30. Mention the applications of single phase induction motor. *2 K1 CO5*

PART - C (6 × 10 = 60 Marks)

Answer ALL Questions

31. a) Derive the generated EMF expression for an alternator. What will be the rms value of emf induced per phase in 3-phase, 6-pole, star-connected alternator having a stator with 90 slots and 8 conductors per slot? The flux per pole is 0.4mWb and it runs at a speed of 1000 rpm. Assume full- pitched coils and sinusoidal flux distribution. *10 K2 CO1*

OR

b) How the regulation of an alternator is found using EMF method? A single-phase, 500 V, 50 Hz alternator produces a short-circuit current of 170 A and an open circuit emf of 425 V when a field current of 15A passes through its field winding. If its armature has an effective resistance of 0.2 ohm, determine its full-load regulation at unity pf and at 0.8 pf lagging using EMF method. *10 K2 CO1*

32. a) Explain the V- curve and inverted V curve with neat diagram. *10 K2 CO2*

OR

	b)	Discuss the starting methods of synchronous motor.	*10*	*K2*	*CO2*
33.	a)	Describe the constructional features of both the squirrel cage induction motor and the slip ring induction motor.	*10*	*K2*	*CO3*
		OR			
	b)	Explain the torque-slip characteristics of three phase induction motor.	*10*	*K2*	*CO3*
34.	a)	List the starting methods of inductionmotor. Explain the Rotor resistance starter and Auto transformer starter for three phase induction motor.	*10*	*K2*	*CO4*
		OR			
	b)	What are the various types of braking in induction motor? Explain any two braking methods of induction motor.	*10*	*K2*	*CO4*
35.	a)	Explain why the single phase induction motor is not self-starting? State the reason and explain the double field revolving theory.	*10*	*K2*	*CO5*
		OR			
	b)	Explain the step by step equivalent circuit of single phase Induction motor with neat diagram.	*10*	*K2*	*CO5*
36.	a) i)	What are the speed control in stator side and the factors that influence the speed control of Induction motor?	*5*	*K2*	*CO4*
	ii)	Explain the capacitor start induction motor with neat diagram, phasor diagram.	*5*	*K2*	*CO5*
		OR			
	b) i)	Explain the speed control of V/f method.	*5*	*K2*	*CO4*
	ii)	Explain the characteristics of shaded pole induction motor with neat diagram.	*5*	*K2*	*CO5*