Reg. No.															

Question Paper Code	13651

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2025

Fourth Semester

Electrical and Electronics Engineering

20EEPC401 - SYNCHRONOUS AND INDUCTION MACHINES

Regulations - 2020

Duration: 3 Hours Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	Which method is also known as the ampere turn method for calculating voltage regulation? (a) Equivalent circuit method (b) Synchronous impedance method (c) MMF Method (d) Direct method	1	K1	CO1
2.	The method used to determine (X_d) and (X_q), the direct and quadrature axis reactance is called (a) Reactance test (b) Blondel's two reaction theory (c) Slip test (d) All of the mentioned	1	K1	CO1
3.	The damping winding in a synchronous motor is generally used (a) To provide starting torque only (b) To reduce noise level (c) To reduce eddy currents (d) To prevent hunting and provide the starting torque	1	K1	CO2
4.	Synchronous capacitor is (a) An ordinary static capacitor bank b) An over excited synchronous motor driving mechanical load (c) An over excited synchronous motor running without mechanical load (d) None of the mentioned	1	K1	CO2
5.	The rotor winding for a 3-phase slip-ring induction motor having delta-connected stator must be connected in (a) delta (b) star (c) delta or star according to need (d) none of the mentioned	1	K1	CO3
6.	In the squirrel-cage induction motor the rotor slots are usually given slight skew (a) To reduce the magnetic hum and locking tendency of the rotor (b) To increase the tensile strength of the rotor bars (c) To ensure easy fabrication (d) None of the mentioned	1	K1	CO3
7.	An induction motor when started on load does not accelerate up to full speed but runs at 1/7th of the rated speed. The motor is said to be (a) locking (b) plugging (c) crawling (d) cogging	1	K1	CO4
8.	The speed of a slip-ring three phase induction motor can be controlled from the rotor side by (a) changing the supply voltage (b) changing the supply frequency (c) rheostatic control (d) changing the number of poles	1	K1	CO4
9.	In a shaded pole motor the phase splitting is achieved by placing a shading coil at the slot cut around the (a) larger part of the pole (b) smaller part of the pole (c) both the parts of the pole (d) any of the mentioned	1	K1	CO5
10.	Single phase induction motors are made self starting by (a) increasing rotor resistance (b) using an external starting device (c) providing an additional winding on the stator called the auxiliary winding (d) any of the mentioned methods.	1	K1	CO5

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

11.	Define the term voltage regulation of alternator.	2	K1	CO1
12.	Infer the conditions for parallel operation of alternators.	2	K2	CO1
13.	Infer why is the synchronous impedance method of estimating voltage regulation is considered as pessimistic method?	2	K2	CO1
14.	Why 3-phase synchronous motor will always run at synchronous speed?	2	K1	CO2
15.	Infer why synchronous motors are not self starting.	2	K2	CO2
16.	List out the applications of synchronous condenser.	2	K1	CO2
17.	Write an expression for the slip of an induction motor.	2	K1	CO3
18.	Explain why the rotor speed of an induction motor always less than the synchronous speed.	2	K2	CO3
19.	List out the methods of speed control of cage type 3-phase induction motor.	2	K1	CO4
20.	While controlling induction motor speed, how super-synchronous speed is achieved?	2	K2	CO4
21.	State the advantage of capacitor-run over capacitor-start motor.	2	K1	CO5
22.	List out the starting methods for single phase induction motor.	2	K1	CO5

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

23.	a)	Enumerate clearly the Potier Method of determining the regulation of an alternator.	11	K3	CO1
		OR			
	b)	A three phase 50 Hz star connected, 2000KVA,2300V alternator gives a short circuit current of 540A for a certain field excitation. With the same excitation, the open circuit voltage is 870V. The resistance between a pair of terminals is 0.14 Ω. Find Full load voltage regulation at (i) U.P.F (ii) 0.8 p.f. lagging (iii) 0.9 p.f. leading.	11	K3	CO1
24.	a)	Explain V and inverted V curves of a synchronous motor with necessary diagram.	11	K2	CO2
		OR			
	b)	Derive the expression for maximum power developed by a synchronous motor.	11	K2	CO2
25.	a)	Illustrate Torque – Slip characteristics of the 3 phase induction motor.	11	K3	CO3
		OR			
	b)	An 18.65 KW, 4 pole, 50Hz, 3 phase induction motor has friction and windage losses of 2.5 percent of the output. Full load slip is 4%. Find the full load (i) Rotor copper loss (ii) rotor input (iii) Shaft Torque (iv) The Gross electromagnetic torque.	11	K3	CO3
26.	a)	Describe in detail the methods of slip power recovery scheme of three phase induction motor with its advantages and disadvantages.	11	K2	CO4
		OR			
	b)	Explain with neat sketches, the working of star-delta starter and rotor resistance starter.	11	K2	CO4
27.	a)	Explain the construction and principle of operation of shaded pole induction motor.	11	K2	CO5
		OR			
	b)	Draw the equivalent circuit of single-phase induction motor and discuss the experimental procedure to obtain its parameter.	11	K2	CO5

28.	a) (i)	Explain with neat sketch, the working of auto transformer starter.	*6*	*K2*	*CO4*
	(ii)	Explain the no load test and blocked rotor test on a single-phase induction motor.	*5*	*K2*	*CO5*
		OR			
	b) (i)	Explain the cascade operation of induction motors to obtain variable speed.	*6*	*K2*	*CO4*
	(ii)	Write short notes on double field revolving theory.	*5*	*K2*	*CO5*