GURU NANAK INSTITUTE OF TECHNOLOGY
An Autonomous Institute under MAKAUT
2022
ELECTRICAL MACHINES II
EE501

TIME ALLOTTED: 3HR **FULL MARKS:70**

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable

GROUP – A
(Multiple Choice Type Questions)

Answer any ***ten*** from the following, choosing the correct alternative of each question: **10×1=10**

			Marks	CO No.
1.	(i)	A hysteresis motor a. Is not a self-starting motor b. Is a constant speed motor c. Need dc excitation d. Cannot run in reverse direction.	1	CO1
	(ii)	Which of the following motors is preferred for tape-recorders? a. Shaded pole motor b. Hysteresis motor c. Two value capacitor motor d. Universal motor	1	CO1
	(iii)	Synchronous motors are generally not self-starting because a. the direction of rotation is not fixed b. the direction of instantaneous torque reverses after half cycle c. starters cannot be used on these machines d. starting winding is not provided on the machines	1	CO2
	(iv)	In a capacitor start motor, the phase displacement between starting and running winding can be nearly a. 10° b. 30° c. 60° d. 90°	1	CO2
	(v)	If a stationary alternator is connected to live bus-bars, it will result in a. open circuit b. floating of the alternator c. short circuit d. none of the above	1	CO3

(vi)	A ceiling fan uses a. Split phase motor. b. Capacitor start capacitor run motor c. Universal motor d. Capacitors start motor	1	CO5
(vii)	Direction of rotation of a split phase motor can be reversed by reversing the connection of a. Running winding only b. Starting winding only c. Either (a) or (b) d. Both (a) and (b)	1	CO3
(viii)	In a shaded pole motor, the shading coil usually consist of a. a single turn of heavy wire which is in parallel with running winding b. a single turn of heavy copper wire which is short-circuited and carries only induced current c. a multilayer fine gauge copper wire in parallel with running winding d. none of the above	1	CO2
(ix)	The power factor of a single-phase induction motor is usually a. lagging b. always leading c. unity d. unity to 0.8 leading	1	CO5
(x)	The power factor of the alternator under short circuit condition is almost near to a. unity b. zero lagging c. zero leading d. 0.8 p.f lagging	1	CO2
(xi)	A synchronous motor can be used as a synchronous capacitor when it is a. under-loaded b. over-loaded c. under-excited d. over-excited	1	CO1
(xii)	Synchro is an electrical transducer that converts a. speed of rotation to voltage b. rate of speed change to voltage c. angular position to voltage d. Direction of rotation to voltage	1	CO1

GROUP – B
(Short Answer Type Questions)
(Answer any *three* of the following) 3 x 5 = 15

		Marks	CO No.
2.	Why universal motors are designed to run preferably at very high speeds?	5	CO 1
3.	Explain why a single-phase single winding induction motor produces no starting torque	5	CO2
4.	What is the necessity of parallel operation of alternator? Explain the condition for parallel operation.	5	CO3
5.	Name the various methods of starting single phase induction motor and mention which mode of starting will provide high starting as well as running torque.	5	CO2
6.	Explain why in a universal motor, the performance of the machine is better under d.c. than in a.c. operation.	5	CO3

GROUP – C
(Long Answer Type Questions)
(Answer any *three* of the following) 3 x 15 = 45

		Marks	CO No.
7. a)	Explain double revolving field theory of single phase induction motor. From there, draw the torque-speed characteristics.	6	CO2
b)	What will happen if the shading coil is left open during starting of a shaded pole type, single phase induction motor?	3	CO3
c)	The following data relates to test on a 110 V, 150 W, 50 Hz, 6-pole single phase induction motor: No-load test 110 V, 63 W, 2.7 A Blocked-rotor test 55 V, 212 W, 5.8 A The stator winding resistance is 2.5 Ω and during the blocked-rotor test, the starting winding is open. Determine the equivalent circuit parameters. Also, find the core, friction and windage losses.	6	CO3
8.a)	What is damper winding? Why is damper winding used in salient pole synchronous machine?	4	CO1
b)	Derive the condition of maximum starting torque of resistance split phase induction motor	5	CO2
c)	A 150 KVA, 400 V, 50 Hz, three-phase star connected alternator has effective armature resistance of 0.3 ohm. The field current of 40 A produces short circuit current of 200 A and an open circuit EMF of 1000 V (line value). Calculate the full load regulation at (a) 0.8 power factor lagging and (b) 0.8 power factor leading.	6	CO3
9.a)	What methods are adopted to start a single-phase induction motor?	5	CO2
b)	A 20 MVA, 3-phase star connected alternator, with an impedance of 5 ohms and resistance of 0.5 ohm, is operating in parallel with constant voltage 11 kV bus-bar. The field current is adjusted to give an excitation voltage of 12 kV, then calculate i) maximum power output from the alternator and ii) armature current and pf under maximum power condition.	6	CO3

c)	A three phases star connected synchronous alternator is rated at 1.6 MVA, 13.5 kV. The armature resistance and synchronous reactance are 1.5 Ω and 30 Ω respectively per phase. Calculate the percentage voltage regulation for a load of 1280 kW at 0.8 pf leading.	4	CO2
10.a)	What are the different methods of determination of regulation of an alternator? Which of these methods is known 'optimistic' and why? Briefly describe the method only.	6	CO1
b)	A universal motor (A.C operated) has 2-pole armature with 690 conductors. At a certain load the motor speed is 4500 rpm and armature current is 4.5 A, the armature terminal voltage and input are 110 V and 350 W respectively. If the armature resistance is 2.5ohm, compute the effective armature reactance and maximum value of useful flux/pole.	4	CO3
c)	Explain the operating principle of a linear induction motor.	5	CO2
11.	Write short notes on any *three* of the following:	3x5=15	
a)	Hysteresis Motor	5	CO1
b)	V-curve & Inverted V-curve of synchronous motor	5	CO2
c)	Synchronous Reluctance Motor	5	CO1
d)	No-load and blocked rotor test of single-phase induction motor	5	CO3
e)	Hybrid Stepper Motor	5	CO2