GURU NANAK INSTITUTE OF TECHNOLOGY
An Autonomous Institute under MAKAUT
2020-2021
ELECTRICAL MACHINE-II
EE501

TIME ALLOTTED: 3 HOURS   **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) In case of a reluctance motor, when the load is increased so that it cannot maintain synchronous speed the motor will
   a) Become unstable
   b) Run as induction motor
   c) Burn out
   d) None of the above

   1   CO2

   ii) 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   CO 1

   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   CO 2

   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   CO 2

   v) In a double revolving field theory of single phase induction motor, the slip of the forward motor is s then the slip of the backward motor is
   a) 2 s.
   b) 2 – s.
   c) s.
   d) s – 2

   1   CO2

vi) A ceiling fan uses
    a) Split phase motor.
    b) Capacitor start capacitor run motor.   1   CO2
    c) Universal motor
    d) Capacitor run motor

vii) In a capacitor start and run motors the function of the running capacitor in series with the auxiliary winding is to
    a) improve power factor
    b) increase overload capacity   1   CO 2
    c) reduce fluctuations in torque
    d) to improve torque

viii) For providing a load power of 60 MW at 0.8 pf, ratings of alternator, its prime-mover, boiler and the transformer should respectively be
    a) 60 MW, 75 MVA, 75 MVA, 75 MVA   1   CQ2
    b) 75 MVA, 60 MW, 60 MW, 75 MVA
    c) 75 MVA, 60 MW, 75 MVA, 75 MVA
    d) 75 MVA, 75 MVA, 60 MW, 75 MVA

ix) The method of reducing the harmonic in an alternator are
    a) well distributed winding
    b) using short pitch winding   1   CO1
    c) slots are skewed
    d) all of the above

x) In A.C. series motor compensating winding is employed to
    a) Increase the torque
    b) Reduce the effect of armature reaction   1   CO1
    c) Reduce sparking in brushes
    d) Both b and c

xi) Direction of rotation of a split phase motor can be reversed by reversing the connection of
    a) running winding only
    b) starting winding only   1   CO 3
    c) either (a) or (b)
    d) both (a) and (b)

xii) A stepper motor is
    a) a dc motor.
    b) a single-phase ac motor.   1   CO3
    c) a multi-phase motor.
    d) a two phase motor.

GROUP – B
(Short Answer Type Questions)
Answer any *three* from the following: **3×5=15**

			Marks	CO No
2.		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	CO 2
3.	a)	Explain briefly double revolving field theory for single-phase induction motor.	4	CO2

	b)	Why single phase induction machine is called fractional Kilo-watt motor?	1	CO1
4.		What is the necessity of parallel operation of alternator? Explain the condition for parallel operation.	5	CO 3
5.		In an alternator, a lagging current has the effect of weakening the main field; but in a synchronous motor, the effect of lagging current is to strengthen the main field. Explain.	5	CO2
6.		A 2.2 KV,100 KVA star connected alternator gave the following test results: Effective resistance per phase=1 ohm Open circuit (OC) test: At $I_f = 12.5\ A$, Line Voltage $V_{t\ (line)}=$ 420V Short circuit (SC) test: At $I_f = 12.5\ A$, Line current I_a = rated value. Calculate the voltage regulation of alternator at 0.8 pf lagging.	5	CO 3

GROUP – C
(Long Answer Type Questions)
Answer any *three* from the following: **3×15=45**

			Marks	CO No.
7.	a)	Explain double revolving field theory of single phase induction motor. From there, draw the torque-speed characteristics.	6	CO 2
	b)	What will happen if the shading coil is left open during starting of a shaded pole type, single phase induction motor?	3	CO 3
	c)	For a 240V, 50 Hz, 4-pole split-phase capacitor start type single phase induction motor the following test data are obtained at standstill: With main winding disconnected: 60V, 0.8A, 30W With centrifugal switch opened: 80V, 1.6A, 25W Determine: i) Value of the capacitor for maximum starting torque. ii) Value of the capacitor necessary to make auxiliary and main winding currents in quadrature.	6	CO 3
8.	a)	Briefly describe rotor oscillation phenomena of synchronous machine.	4	CO2
	b)	What are the advantages of installing a synchronous condenser in an electrical system? Illustrate your answer with an example.	5	CO1
	c)	Consider a 3300 V delta connected synchronous motor having a synchronous reactance per phase of 18 Ω. It operates at a leading p.f of 0.707 while drawing 800 kW from mains. Calculate its excitation e.m.f and load angle.	6	CO2

9.	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	CO 1
	b)	Why universal motors are designed to run preferably at very high speeds?	4	CO 1
	c)	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.	5	CO 3
10.	a)	Explain what causes hunting in a synchronous machine. Explain the methods adopted to minimize hunting.	5	CO 2
	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	CO 3
	c)	Explain two reaction model of salient pole synchronous machine.	4	CO 2
11.		Write short notes on any three of the following:	3x5	
	a)	Inverted v-curve of synchronous motor	5	CO1
	b)	Brushless DC motors	5	CO3
	c)	Servo motors	5	CO3
	d)	No-load and blocked rotor test of single-phase induction motor	5	CO3
	e)	Stepper motor	5	CO2