Reg.No. _____

Karunya UNIVERSITY

(Karunya Institute of Technology & Sciences)
(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

End Semester Examination – Nov/Dec – 2016

Code : 14EE2007 **Semester : 2016-17 ODD**
Sub. Name : Induction and Synchronous Machines **Duration : 3hrs**
Max. marks : 100

ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)

Q. No.	Sub Div.	Questions	Course Outcome	Marks
1.	a.	Derive the torque equation and the maximum value of a three phase induction motor under running condition.	CO1	**12**
	b.	Deduce the expression for ratio of full load torque and maximum torque.	CO1	**04**
	c.	What are the effects of changes in supply voltage on torque and speed of a three phase induction motor?	CO1	**04**
		(OR)		
2.	a.	A 440V, three phase, 50Hz, 37.3kW, star connected induction motor has the following parameters: $R_1 = 0.1\Omega$, $X_1 = 0.4\Omega$, $R'_2 = 0.15\Omega$, $X'_2 = 0.44\Omega$. Motor has stator core loss of 1250W and rotational loss of 1000W. It draws a no-load line current of 20A at a pf of 0.09 (lag). When motor operates at a slip of 3%, calculate (i) input line current and pf (ii) electromagnetic torque developed in Nm (iii) output and (iv) efficiency of the motor.	CO1, CO2	**10**
	b.	Brief the methods of controlling the speed of a three phase slip ring induction motor from the rotor side.	CO1, CO2	**10**
3.		Using double revolving field theory, explain why a single phase induction motor is not self starting. Draw the torque slip curve of a single phase induction motor.	CO1	**20**
		(OR)		
4.	a.	Describe the constructional features and the operation of the following: (i) Stepper motor (ii) Shaded pole motor	CO1	**10**
	b.	Write the different starting methods of a single phase induction motor?	CO1	**10**
5.	a.	Derive the emf equation of an alternator.	CO2	**6**
	b.	The following test results are obtained on a 6600V alternator: I_f (amps) 16 20 25 37.5 50 70 EMF(volts) 3100 4200 4900 6600 7500 8300 A field current of 20A is found necessary to circulate full load current on short circuit of the armature. Calculate the voltage regulation of the alternator by (i) ampere turn method (ii) Synchronous Impedance method.	CO2	**14**
		(OR)		
6.		A 750-kVA, 11kV, 4pole, three phase star connected alternator has armature resistance and reactance of 1.6Ω and 23.8Ω respectively. Calculate the synchronizing power and torque per mechanical degree of displacement at (i) no load (ii) at full load 0.8 pf lagging. The terminal voltage in each case is 11kV.	CO2	**20**
7.		A 5kVA, 415V, three phase, 4pole, star connected salient pole synchronous generator has direct axis reactance of 19Ω and quadrature reactance of 15Ω respectively. Determine the voltage regulation of the alternator operating at full load with 0.8 pf leading and lagging.	CO3	**20**
		(OR)		

8.		Draw the phasor diagram of a Salient pole synchronous machine (both generator and motor) working at lagging and leading power factor conditions.	CO3	**20**
		Compulsory:		
9.	a.	Discuss briefly why synchronous motors are inherently not self starting. Explain the different methods for starting of synchronous motors.	CO1, CO3	**10**
	b.	Write a brief notes on effect of DC excitation on armature current and power factor of a synchronous motor.	CO3	**10**

ALL THE BEST