

May 2019

26

Exam.Code:0934
Sub. Code: 6977

1059
B.E. (Electrical and Electronics Engineering)
Fourth Semester
EE-401: Electric Machinery – II

Allowed: 3 Hours

Max. Marks: 50

Attempt five questions in all, including Question No. 1 (Section-A) which is compulsory and selecting two questions each from Section B-C.

x-x-x

Q.No.	Section-A	Marks
1.	a) Why an Alternator is called Synchronous generator?	02
	b) Why almost all large size Synchronous machines are constructed with rotating field system type?	02
	c) Define leakage reactance, synchronous reactance and synchronous impedance.	02
	d) What is the recoil line in a PM motor ?	02
	e) Under what conditions, a PM motor can be completely demagnetized ?	02
	Section-B	
2.	a) An industrial plant has an installed load of 10,000 kVA at 0.8 p.f lag. A large compressor is to be installed which requires 1500 kW of power. Compare the total plant kVA with the following: i) load driven by an induction motor (0.8 p.f lag) and ii) load driven by a synchronous motor with the field adjusted to give the motor a power factor of 0.5 lead. Draw the appropriate phasor diagrams .	07
	b) Explain the various starting methods of a synchronous motor.	03
3.	a) A 2300 volts, 3-phase, 60 Hz, Y-connected cylindrical-rotor synchronous motor has a synchronous reactance of 11Ω per phase. When it delivers 200 hp, the efficiency is found to be 90%, excluding the field loss; the power angle is 15 electrical degrees. Neglecting the ohmic resistance, determine: i) The per phase induced excitation voltage, E_a ii) The line current, I_a iii) The power factor	07
	b) Describe how the synchronous motor can be made to attain synchronous speed?	03
4.	a) A 3-phase, 6-pole, star connected alternator has a rated speed of 1000 rpm. The stator has 90 slots and 8 conductors per slot. The sinusoidal distributed flux per pole is 0.05 Wb. Calculate the voltage generated by the machine if the winding factor is 0.96.	07
	b) What is the purpose of having the damper windings in rotating electrical machines?	03

P.T.O.

Exam Code: 6977
Sub Code: 6977

Sub. Code: 6977

(2)

Section-C																				
5.	a) A 2-pole, 50 Hz, 3-phase, turbo-alternator is excited to generate the bus-bar voltage of 11 kV on no-load. The machine is star-connected and the short-circuit current for this excitation is 1 kA. Calculate the synchronizing power per degree of mechanical displacement of the rotor and the corresponding synchronizing torque.	06																		
	b) Describe the principle of operation of a linear induction motor.	04																		
6.	a) The following data pertains to a 5000 kVA, 6600 V, 3-phase, 50 Hz star-connected alternator: <table border="1"> <tr> <td>Field Current, Amp</td> <td>32</td> <td>50</td> <td>75</td> <td>100</td> <td>140</td> </tr> <tr> <td>O.C. Terminal Voltage, Volts</td> <td>3100</td> <td>4900</td> <td>6600</td> <td>7500</td> <td>8300</td> </tr> <tr> <td>Zero p.f. test line p.d., Volts</td> <td>0</td> <td>1850</td> <td>4250</td> <td>5800</td> <td>7000</td> </tr> </table> <p>Determine the regulation and draw phasor diagram by zero power factor method at full-load unity power factor. Neglect armature resistance.</p>	Field Current, Amp	32	50	75	100	140	O.C. Terminal Voltage, Volts	3100	4900	6600	7500	8300	Zero p.f. test line p.d., Volts	0	1850	4250	5800	7000	08
Field Current, Amp	32	50	75	100	140															
O.C. Terminal Voltage, Volts	3100	4900	6600	7500	8300															
Zero p.f. test line p.d., Volts	0	1850	4250	5800	7000															
	b) Explain the process of synchronizing an alternator to infinite bus-bar.	02																		
7.	a) Calculate the magnetic flux in a 250 W, 120 V PM motor operating at 1450 rpm. The motor constant is 82, the armature resistance is 2 ohm and the rotational loss is 16 W.	05																		
	b) Calculate the developed thrust of a LIM with a pole pitch of 50 cm which is used on a trolley that travels a distance of 10 km. The resistance and the current of the secondary side as referred to the primary side are 4 ohms and 500 A respectively. The slip is 25% and the motor is operating at 50 Hz.	05																		

x-x-x