KADI SARVA VISHVAVIDYALAYA

B.E. SEMESTER IV EXAMINATION (MAY/2014)

SUBJECT CODE: EE-403 **SUBJECT NAME:** ELECTRICAL MACHINE -II

DATE: 13/05/2014 **TIME:** 10: 30 a.m. to 1:30 p.m. **TOTAL MARKS:** 70

Instructions:

1. Answer each section in separate answer sheets
2. Use of scientific Calculator is permitted
3. All questions are compulsory
4. Indicate clearly the options you attempted along with the respective question number.
5. Use the last page of your supplementary for rough work

Section – I

Q-1

A Derive the expression of starting and running torque. Also derive the condition for maximum starting torque. **5**

B Compare types of synchronous machines depending upon: **5**
(a) Shape of the rotor
(b) Dimensions of the machines
(c) Application of the machine
(d) Prime mover to be used
(e) No. of poles and speed

C Draw and explain phasor diagram and equivalent circuit of a 3 phase induction motor. **5**

OR

C Explain construction of V-curves for a synchronous motor. **5**

Q-2 **Answer the following questions**

A State different methods of speed control of 3- phase Induction motor. Explain anyone method of speed control of 3- phase slip ring induction motor from the rotor side. **5**

B Find the no load phase and line voltage of star connected 3 phase , 6 pole alternator which runs at 1200 rpm, having flux per pole of 0.1 Wb sinusoidally distributed . Its stator has 54 slots having double layer winding. Each coil has 8 turns and coil is chorded by 1 slot. **5**

OR

A What is voltage regulation of an alternator? Explain any one method to determine voltage regulation in detail. **5**

B A 3 phase induction motor having a star connected rotor has an induced e.m.f. of 80 volts between slip-rings at standstill on open circuit. The rotor has a resistance and reactance per phase of 1Ω and 4Ω respectively. Calculate current/phase and power factor when (a) slip-rings are short-circuited (b) slip rings are connected rheostat of 3Ω per phase. **5**

Q-3	**Answer the following questions**	
A	Explain no-load and blocked rotor tests of a 3 phase induction motor.	**5**
B	A 440V, 3 phases, 50 Hz, 4 pole, Y connected induction motor has a full load speed of 1425 rpm. The rotor has an impedance of (0.4 + j4) ohm and rotor/stator turn ratio of 0.8. Calculate (i) full-load torque (ii) rotor current and full load rotor Cu loss (iii) power output if windage and friction losses amount to 500W (iv) maximum torque and the speed at which it occurs (v) starting current and (vi) starting torque.	**5**
	OR	
A	Draw and explain vector diagrams of loaded alternator for unity, lagging and leading power factor.	**5**
B	Draw distributed winding diagram for a 36 slots, 6 pole, 3 phase alternator.	**5**

Section – II

Q-4		
A	Draw the circle diagram for a 3.73kW , 200V, 50 Hz , 4 pole , 3-phase star connected induction motor from the following test data: **No-load :** Line voltage 200V, line current 5 A; total input 350W **Blocked rotor:** Line voltage 100 V , line current 26 A; total input 1700W Estimate from the diagram for full-load condition, the line current and power factor and also the maximum torque in terms of the full-load torque. The rotor Cu loss at standstill is half the total Cu loss.	**5**
B	Derive the equation of induced emf of an alternator.	**5**
C	List the starters used in squirrel cage induction motor. Explain any one in detail.	**5**
	OR	
C	Explain the reasons for variation in terminal voltage of an alternator on load.	**5**
Q-5	**Answer the following questions**	
A	Explain cogging and crawling phenomenon of a 3 phase induction motor.	**5**
B	An 18.65-kW, 4-pole, 50 Hz, 3 phase induction motor has friction and windage losses of 2.5 percent of the output. The full load slip is 4 %. Compute for full load (a) the rotor Cu loss (b) the rotor input (c) the shaft torque (d) the gross electromagnetic torque.	**5**
	OR	
A	What are the conditions for synchronization of alternators? Explain synchronization of a single phase alternator.	**5**
B	Explain short pitch factor, distribution factor and effect of harmonics on them.	**5**
Q-6	**Answer the following questions**	
A	Explain magnetic levitation with its advantages and disadvantages.	**5**
B	Explain hunting in synchronous motor and its prevention.	**5**
	OR	
A	Explain double squirrel cage induction motor. Explain its advantage over squirrel cage induction motor.	**5**
B	Draw and explain power flow diagram within a synchronous motor.	**5**

**********ALL THE BEST**********

KADI SARVA VISHVAVIDYALAYA

B.E. SEMESTER IV EXAMINATION (NOV/2014)

SUBJECT CODE: EE-403 SUBJECT NAME: ELECTRICAL MACHINE -II

DATE: 05/11/2014 TIME: 10: 30 a.m. to 1:30 p.m. TOTAL MARKS: 70

Instructions:

1. Answer each section in separate answer sheets
2. Use of scientific Calculator is permitted
3. All questions are compulsory
4. Indicate clearly the options you attempted along with the respective question number.
5. Use the last page of your supplementary for rough work

Section – I

Q-1	A	Derive the equation of induced emf of an alternator.	5
	B	Explain basic construction of an Alternator.	5
	C	Draw and explain an equivalent circuit of a 3 phase induction motor.	5
		OR	
	C	Explain construction of V-curves for a synchronous motor.	5
Q-2	A	Explain anyone method of speed control of 3- phase slip ring induction motor from the rotor side.	5
	B	Find the no load phase and line voltage of star connected 3 phase , 6 pole alternator which runs at 1200 rpm, having flux per pole of 0.1 Wb sinusoidally distributed . Its stator has 54 slots having double layer winding. Each coil has 8 turns and coil is chorded by 1 slot.	5
		OR	
Q-2	A	Explain Synchronous Impedance method to determine voltage regulation in detail.	5
	B	A 3 phase induction motor having a star connected rotor has an induced e.m.f. of 80 volts between slip-rings at standstill on open circuit. The rotor has a resistance and reactance per phase of 1Ω and 4Ω respectively. Calculate current/phase and power factor when (a) slip-rings are short-circuited (b) slip rings are connected rheostat of 3Ω per phase.	5
Q-3	A	Explain no-load and blocked rotor tests of a 3 phase induction motor.	5
	B	A 3000 kVA, 6-pole alternator runs at 1000 rpm in parallel with other machines on 33300-V bus-bars. The synchronous reactance is 25%. Calculate the synchronizing power for one mechanical degree of displacement and the corresponding synchronizing power.	5
		OR	
Q-3	A	Draw and explain vector diagrams of loaded alternator for unity, lagging and leading power factor.	5
	B	Draw distributed winding diagram for a 36 slots, 6 pole, 3 phase alternator.	5

Section – II

Q-4	A	Only Draw the circle diagram for a 14.9 kW , 400V, 50 Hz , 4 pole , 3-phase star connected induction motor from the following test data: **No-load :** Line voltage 400V, 1250W, line current 9 A; **Blocked rotor:** Line voltage 150 V , 4 kW, line current 38 A.	5
	B	From the above circle diagram find the full-load value of current, power factor and slip.	5
	C	List the starters used in squirrel cage induction motor. Explain any one in detail.	5
		OR	
	C	Compare synchronous motor and Induction Motor.	5
Q-5	A	Explain cogging and crawling phenomenon of a 3 phase induction motor.	5
	B	An 18.65-kW, 4-pole, 50 Hz, 3 phase induction motor has friction and windage losses of 2.5 percent of the output. The full load slip is 4 %. Compute for full load (a) the rotor Cu loss (b) the rotor input (c) the shaft torque (d) the gross electromagnetic torque.	5
		OR	
Q-5	A	What are the conditions for synchronization of alternators? Explain synchronization of a single phase alternator.	5
	B	Explain (1) Pitch Factor (2) Distribution factor with suitable example.	5
Q-6	A	Explain magnetic levitation with its advantages and disadvantages.	5
	B	Explain Principal of operation of Synchronous Motor.	5
		OR	
Q-6	A	Explain double squirrel cage induction motor. Explain its advantage over squirrel cage induction motor.	5
	B	Draw and explain power flow diagram within a synchronous motor.	5

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KADI SARVA VISHVAVIDYALAYA

B.E. SEMESTER IV EXAMINATION May 2015

SUBJECT CODE: EE-403 **SUBJECT NAME: Electrical Machines-II**

DATE: 2/05/2015 **TIME:** 10: 30 a.m. to 1:30 p.m. **TOTAL MARKS:** 70

Instructions:

1. Answer each section in separate answer sheets
2. Use of scientific Calculator is permitted.
3. All questions are compulsory
4. Indicate clearly the options you attempted along with the respective question number.
5. Use the last page of your supplementary for rough work.

Section – I

Q-1A	Draw and explain Speed-Torque characteristics of 3-Phase Induction Motor.	**5**
B	. With suitable diagram explain the terms with respect to ac armature winding. i) Phase spread ii) Chorded winding iii) Coil span	**5**
C	An 8 pole, 3 phase, 50Hz induction motor is running at a speed of 710rpm with an input power of 35 KW.The stator losses at this operating condition are known to be 1200W while the rotational losses are 600W.Find (i) the rotor copper loss, (ii) the gross torque developed, (iii) the gross mechanical power developed, (iv) the net torque and (v) the mechanical power output.	**5**
	OR	
C	Derive an equation of torque developed by 3-phase Induction Motor.	**5**
Q-2 A	Why does the rotor of 3-Phase Induction motor rotate? Explain in brief.	**5**
B	Classify various types of ac armature windings.	**5**
	OR	
Q-2 A	Explain steps to construct circle diagram of 3-Phase Induction Motor.	**5**
B	Enlist advantages of fractional pitch winding.	**5**
Q-3A	Enlist different methods to find out slip of 3-Phase Induction Motor. Explain any one method in brief.	**5**
B	Design and develop a mush winding for a 4 pole, 24 slots, 3-phase stator of ac machines. Draw a winding diagram for R phase only.	**5**
	OR	
Q-3A	Explain Crawling and Cogging in 3-Phase Induction Motor.	**5**
B	Give comparison of deep bar rotor and double cage rotor of 3-Phase Induction motor.	**5**

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Section – II

Q-4A	Write a short note on V curves and inverted V curves.	5
B	Enlist different methods of finding voltage regulation in alternator. Explain any one method in detail.	5
C	Give comparison of 3-phase Induction Motor and 3-pahse synchronous motor.	5
	OR	
C	Enlist and explain different torques produced in Synchronous motor.	5
Q-5A	Explain the operation of synchronous motor at constant load variable excitation.	5
B	A 3-phase, 6600V, 50Hz, synchronous motor takes 50A current. The resistance and synchronous reactance per phase are 1 Ω and 20Ω respectively. Find the power supplied to motor and induced emf for a p.f (i) 0.8 lagging (ii) 0.8 leading.	5
	OR	
Q-5A	What is Armature reaction? Explain effect of armature reaction at different power factor in alternator.	5
B	Calculate the RMS value of the induced emf per phase of a 10 pole, 3 –phase, 50Hz alternator with 2 slots per pole per phase nd 4 conductors per slot in two layers. The coil span is 150̊ .The flux per pole has a fundamental component of 0.12 Wb and a 20% third component	5
Q-6A	Explain slip test to find X_d and X_q of Synchronous generator.	5
B	Write a short note on hunting in synchronous motor.	5
	OR	
Q-6 A	Explain two reaction theory of salient pole synchronous machines.	5
B	Write a short note on synchronous condenser.	5

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KADI SARVA VISHWAVIDYALAYA

B.E SEMESTER 4th _EXAMINATION (OCTOBER / 2015)

Subject Code: EE-403 **Subject Name: Electrical Machine -II**
DATE: 27/10/2015 **TIME: 10:30Am -1:30 Pm** **Total Marks: 70**
Instructions:
1. Answer each section in separate Answer Sheet.
2. Use of scientific Calculator is permitted.
3. All questions are compulsory.
4. Indicate clearly, the options you attempted along with its respective question number.
5. Use the last page of main supplementary for rough work

Section -1

Q1 (All compulsory)

A. Briefly explain the phenomenon of Crawling and Cogging in induction motor. **05**

B. With suitable diagram explain the terms with respect to a.c. armature winding.

(1) Phase spread

(2) Chorded winding

(3) Coil span

(4) Full pitch coils. **05**

C. Draw the phasor diagram and equivalent circuit of a 3-phase induction motor. **05**

Or

C What is fractional slot winding? Discuss its advantages. **05**

Q 2 Answer the following questions.

A. Explain with necessary figures the effect of variation of voltage and supply frequency on the performance parameters of an induction motor **05**

B. List different methods for finding voltage regulation of an alternator and explain MMF method.. **05**

Or

A. Explain how rotating magnetic field is produced in 3-phase induction motor. **05**

B. Explain the importance of Circle diagram of Polyphase Induction Motor.. **05**

Q 3 Answer the following questions.

A. A 3-phase 6-pole,50 Hz , 400 V star connected induction motor has following test results.

No-Load Test:- 400 V, 9 A, 1250 watts.

Short-circuit Test:- 200 V, 50 A, 6930 watts. Determine the power scale using circle diagram **05**

B. Derive the equation of induced emf for a synchronous generator.. **05**

Or

A. A 3 phase star connected 1000KVA, 11000V alternator has rated current of 52.5 A. The ac resistance of the winding per phase is 0.45 ohm. The test results are given below: O.C. Test: field current = 12.5 A, voltage between lines = 422 V S.C. Test : field current = 12.5A, line current = 52.5A Determine the full load voltage regulation of the alternator for (i) 0.8 p.f. lagging and (ii) 0.8 p.f. leading loads by synchronous impedance method. **05**

B. Explain the slip test for measurement of X d and X q of synchronous machines. **05**

Section 2

Q4 (All compulsory)

A. Derive the expression for the input and output power developed by synchronous motor. Also derive the maximum input and output powerdeveloped by synchronous motor **05**

B. State the conditions necessary for paralleling alternators. Explain one dark and two bright lamp methods with necessary electrical circuit diagram. **05**

C. Explain Armature reaction and its effects at different power factor in Alternator. **05**

Or

C. Why synchronous motor is not self starting? Explain the methods of starting of synchronous motor. **05**

Q 5 Answer the following questions.

A. Briefly explain the operation of a synchronous machine with change in excitation and constant mechanical power input. Draw the corresponding phasor diagrams. **05**

B. State and explain any two method of speed control of Induction motor. **05**

Or

A. Explain hunting of synchronous machines and methods of its prevention **05**

B. What are the causes of harmonics in the voltage waveform of an alternator? How can these be minimized?. **05**

Q 6 Answer the following questions.

A. Explain concept of "Two reaction theory" used for the analysis of a salient pole synchronous machine. **05**

B. List different methods for finding voltage regulation of an alternator and explain ZPF method.. **05**

Or

A. A star connected, 11 KV alternator, with synchronous impedance of 1+j10 per phase is connected to infinite bus at rated voltage. The alternator delivers an armature current of 100 A at unity power factor to the bus bar. With the alternator output remaining constant, the alternator excitation is increased by 15%. Find the new values of armature current, load angle and p.f.. **05**

B. A 2,000 KVA, 3-phase, 8-pole alternator runs at 750 rpm in parallel with other machines on 6,000 V bus-bars. Find synchronising power on full load 0.8 p.f. lagging per mechanical degree of displacement and the corresponding synchronising torque. The synchronous reactance is 6 ohm per phase. **05**

----------All the Best----------