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Code No. : 15356 N/O

**VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS), HYDERABAD**

Accredited by NAAC with A++ Grade

**B.E. (E.E.E.) V-Semester Main & Backlog Examinations, Jan./Feb.-2024****AC Machines**

Time: 3 hours

Max. Marks: 60

Note: Answer all questions from Part-A and any FIVE from Part-B

**Part-A (10 × 2 = 20 Marks)**

Q. No.	Stem of the question	M	L	CO	PO
1.	List any two advantages and two disadvantages of short pitching the coil.	2	1	1	1,2,3
2.	Define distribution factor and write the equation for it.	2	1	1	1,2,3
3.	Write the slip range of an induction motor, and why induction motor cannot run at synchronous speed.	2	1	2	1,2,3
4.	The frequency of the EMF in the stator of a 4 pole induction motor is 50Hz, and that in the rotor is 2 Hz. What is the slip, and at what speed is the motor running.	2	4	2	1,2,3
5.	Explain the necessity of an auxiliary winding in a single-phase split phase induction motor.	2	2	3	1,2,3
6.	Explain, why the no-load current of an Induction motor is more than transformer no-load current for the same rating.	2	4	3	1,2,3
7.	Define synchronous impedance of an alternator. Why alternator impedance is more than other machines.	2	1	4	1,2,3
8.	Explain the de-magnetization effect on the alternator generated EMF with waveform.	2	2	4	1,2,3
9.	Explain why the synchronous motor is not self-starting.	2	2	5	1,2,3
10.	Explain the phenomenon of hunting. How is it prevented?	2	2	5	1,2,3
<b>Part-B (5 × 8 = 40 Marks)</b>					
11. a)	How the rotating magnetic field is generated with the three windings explain with a neat diagram.	4	1	1	1,2,3
b)	A 3-phase, 2-pole Induction motor stator has single layer full pitched winding with 5 slots/pole/phase. If each coil has 4 turns and per phase current is 20A. Sketch the air gap MMF waveform produced by the any one phase. Also determine the maximum and RMS values of fundamental MMF waveform.	4	4	1	1,2,3
12. a)	Derive an expression for the load torque of a 3-phase induction motor, Also draw the slip-torque characteristics of it.	4	4	2	1,2,3
b)	The power input to a 3-phase induction motor is 60kW. The total stator losses are 1kW. Find the total mechanical power developed and the rotor copper losses, if the motor is running with a slip of 4%.	4	4	2	1,2,3

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13. a)	Describe the no-load test and blocked rotor test on 1-phase induction motor.	4	2	3	1,2,3												
b)	A 220V, 1-phase induction motor gave the following test results No-load test: 220V, 4.6A, 125W; Blocked rotor test: 120V, 9.6A, 460W The stator winding resistance is 1.5Ω. Determine the equivalent circuit parameters, friction and windage losses.	4	4	3	1,2,3												
14. a)	Explain the operating principle and derive the EMF equation of an Alternator.	4	4	4	1,2,3												
b)	The following test results were obtained on a 12MVA, 13.8kV synchronous generator	4	4	4	1,2,3												
<table border="1"> <tr> <td>Open circuit voltage(Line)</td> <td>6100</td> <td>10050</td> <td>13200</td> <td>14700</td> <td>16200</td> </tr> <tr> <td>Field current (in Amp)</td> <td>16</td> <td>25</td> <td>37.5</td> <td>50</td> <td>70</td> </tr> </table>		Open circuit voltage(Line)	6100	10050	13200	14700	16200	Field current (in Amp)	16	25	37.5	50	70				
Open circuit voltage(Line)	6100	10050	13200	14700	16200												
Field current (in Amp)	16	25	37.5	50	70												
The full load current was circulated on short circuit with a field excitation of 22A. Calculate the full load voltage regulation at 0.8 power factor lagging by Synchronous Impedance Method																	
15. a)	Explain how the synchronous motor operate in different power factors, explain with suitable phasor diagram.	4	2	5	1,2,3												
b)	A 400 V, 3-phase induction motor takes a current of 36 A at 0.8 p.f lagging. A synchronous motor improves the overall p.f to 0.92 lagging. Simultaneously the synchronous motor drives a 13 kW load. Determine the i) The leading kVAR supplied by the synchronous motor ii) kVA rating of the synchronous motor iii) The operating power factor of the synchronous motor.	4	4	5	1,2,3												
16. a)	List the types of slots used in the AC machines, write the advantages and drawbacks of each type.	4	1	1	1,2,3												
b)	Explain the working, operation of DOL starter of a 3-phase induction motor with neat diagram.	4	2	2	1,2,3												
17.	Answer any <i>two</i> of the following:																
a)	Explain the working of capacitor start and capacitor run induction motors with neat diagram.	4	2	3	1,2,3												
b)	With a neat diagram explain the construction of synchronous machine.	4	2	4	1,2,3												
c)	List the types of synchronous motor starting methods and explain about pony motor method of starting.	4	2	5	1,2,3												

M : Marks; L: Bloom's Taxonomy Level; CO; Course Outcome; PO: Programme Outcome

i)	Blooms Taxonomy Level – 1	20%
ii)	Blooms Taxonomy Level – 2	40%
iii)	Blooms Taxonomy Level – 3 & 4	40%

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