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Code No. : 15346 S N/O

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS), HYDERABAD
 Accredited by NAAC with A++ Grade

B.E. (E.E.E.) V-Semester Supplementary Examinations, June-2023

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.	Write the conditions for the generation of rotating magnetic field.	2	2	1	1,2,3
2.	Calculate the distribution factor for 36-slots , 4 pole single layer three phase winding.	2	4	1	1,2,3
3.	A 3-phase, 50 Hz induction motor has a full-load speed of 1460 r.p.m. For this motor, calculate the full load slip and rotor frequency	2	4	2	1,2,3
4.	Write a short note on the losses in the induction machine.	2	2	2	1,2,3
5.	What is the purpose of the capacitor in single phase induction machine?	2	1	3	1,2,3
6.	List the applications of single-phase induction motor in different fields.	2	1	3	1,2,3
7.	Define the armature reaction in the alternator.	2	1	4	1,2,3
8.	Which method gives accurate voltage regulation and why?	2	1	4	1,2,3
9.	Why synchronous motor is not self-started.	2	1	5	1,2,3
10.	What is synchronous condenser and draw the phasor diagram.	2	1	5	1,2,3
Part-B (5 × 8 = 40 Marks)					
11. a)	Prove that the RMF in the induction motor is rotating?	4	4	1	1,2,3
b)	For a 3-phase coil span of 160 degrees determine the distribution and winding factors in case the winding has phase spread of 120 degrees. take the three-phase winding (a) uniformly distributed (b) to have 9 slots per pole.	4	4	1	1,2,3
12. a)	Derive the torque equation of the 3-phase induction motor, also draw the speed-torque characteristics of it.	4	3	2	1,2,3
b)	3 phase, 50 HZ ,8 pole , induction motor has full load slip of 2% . the motor resistance and stand still rotor reactance per reactance per phase are 0.001 ohm and 0.005 ohm respectively. Find the ratio of the maximum to full load torque and the speed at which the maximum torque occurs.	4	4	2	1,2,3

Contd... 2

13. a)	Explain the starting methods of single-phase induction motors.	4	2	3	1,2,3
b)	A 230 V, 50 Hz, 4-pole single phase induction motor has the following equivalent circuit impedances referred towards stator side: $R_{1m} = 2.2 \Omega$, $R_2 = 4.5 \Omega$, $X_{1m} = 3.1 \Omega$, $X_2 = 2.6 \Omega$ and $X_M = 80 \Omega$ Friction, wind age and core loss = 40 W For a slip of 0.03 pu, calculate a) input current b) power factor c) developed power.	4	4	3	1,2,3
14. a)	With a neat sketch explain the constructional details of the salient pole alternator.	4	2	4	1,2,3
b)	The phase emf of a 3 phase, 50 Hz alternator consists of a fundamental, a 20 % third harmonic and a 10% fifth harmonic. The amplitude of the fundamental voltage is 1000 V. Calculate the rms line voltage when the alternator windings are in (i) Star and (ii) Delta.	4	3	4	1,2,3
15. a)	Describe the mathematical analysis of power developed in synchronous motor.	4	2	5	1,2,3
b)	A 3300 V, star-connected synchronous motor has synchronous impedance of $0.4 + j5$ per phase, for an excitation emf of 4000 V and motor input power of 1000 kW at rated voltage, compute the line current and pf.	4	4	5	1,2,3
16. a)	List the types of slots used in the AC machine winding, and write the advantages and disadvantages of each.	4	1	1	1,2,3
b)	Explain torque- slip characteristics of three phase induction machine with diagram and derive the maximum torque equation.	4	2	2	1,2,3
17.	Answer any <i>two</i> of the following:				
a)	Explain the equivalent circuit of a single-phase induction motor with neat sketch.	4	2	3	1,2,3
b)	Discuss the effect of variation of excitation and mechanical input on the parallel operation of alternators with necessary phasor diagrams?	4	3	4	1,2,3
c)	What are the differences between synchronous motor and induction motor? Write the applications of both motors.	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	35%
iii)	Blooms Taxonomy Level - 3 & 4	45%
