SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

AN AUTONOMOUS INSTITUTION

Approved by AICTE, New Delhi and Affiliated to Anna University, Chennai

IV Semester

B.E-Electrical and Electronics Engineering

23EEB203 – Synchronous and Induction Machines

Regulations 2023

QUESTION BANK

UNIT I & II

	PART A
1	Write down the e.m.f equation of an alternator.
2	Define armature reaction in an alternator.
3	State the difference between salient and cylindrical type rotors.
4	State any four advantages of rotating field and stationary armature.
5	Calculate the distribution factor for a 36 slots, 4 pole, single layer three phase winding of an alternator.
6	Why alternators are rated in kVA and not in kW?
7	Why is the field system of an alternator made as a rotor?
8	Define pull-out torque.
9	Specify the roll of damper winding in synchronous motor.
10	Why a synchronous motor is called as constant speed motor?
11	How the synchronous motor made self-starting?
	PART B
1	Describe the various methods of synchronization with neat sketch.
2	Explain the construction and working principle of synchronous generator with neat diagram. Also derive the EMF equation.
3	A 3 phase, 8 pole, 50 Hz, star connected alternator has 96 slots with 4 conductors per slot. The coil pitch is 10 slots. If the flux per pole is 60 mWb. Find (i) The phase voltage (ii) The Line voltage (iii) If each phase is capable of carrying 650 A, what is the kVA rating of the machine?
4	Two identical 2000 kVA alternators operate in parallel. The governor of the prime mover of first machine is such that the frequency drops uniformly from 50 Hz on load to 48 Hz on full load. The corresponding uniform speed drop of the second machine is 50 Hz to 47.5 Hz. Find (i) How will the two machines share a load of 3000 kW? (ii) What is the maximum load of unity p.f. that can be delivered without overloading either machine?
5	The open circuit and short circuit test is conducted on a 3 phase, star connected, 866 V, 100 kVA alternator. The O.C test results are, I_f Amp. | 1 | 2 | 3 | 4 | 5 | 6 V_{oc} Line Volts | 173 | 310 | 485 | 605 | 728 | 790 The field current of 1 A, produces a short circuit current of 25 A. the armature resistance per phase is 0.15 Ω. Calculate its full load regulation at 0.8 lagging power factor condition.

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<tr><td>6</td><td>A 10 kVA, 440 V, 50 Hz, 3 phase star connected alternator has the open circuit characteristics as given below.
<table>
<tr><td>Field amps (I_f)</td><td>1.5</td><td>3</td><td>5</td><td>8</td><td>11</td><td>15</td></tr>
<tr><td>V_{oc} line Volts</td><td>150</td><td>300</td><td>440</td><td>550</td><td>600</td><td>635</td></tr>
</table>
With full load zero p.f. the applied excitation required is 14 A to produce 500 V of terminal voltage. On short circuit, 4 A excitation is required to give full load current. Determine the voltage regulation for full load, 0.8 p.f. lagging.</td></tr>
<tr><td>7</td><td>The open and short circuit test readings for a 3 phase star connected, 1000 kVA, 2000 V, 50 Hz synchronous generator are
<table>
<tr><td>Open Circuit terminal Voltage $(V_{oc})_{line}$ Volts</td><td>800</td><td>1500</td><td>1760</td><td>2000</td><td>2350</td><td>2600</td></tr>
<tr><td>Short circuit I_{sc} (A)</td><td>-</td><td>200</td><td>250</td><td>300</td><td>-</td><td>-</td></tr>
<tr><td>Field amps (I_f)</td><td>10</td><td>20</td><td>25</td><td>30</td><td>40</td><td>50</td></tr>
</table>
The armature effective resistance is 0.2 Ω per phase. Draw the characteristics curves and estimate full load percentage regulation (a) 0.8 p.f. lagging (b) 0.8 p.f. leading. Use M.M.F Method</td></tr>
<tr><td>8</td><td>A salient pole alternator has direct axis and quadrature axis reactance of 0.8 p.u. and 0.5 p.u. respectively. The effective resistance is 0.02 p.u. Compute percentage regulation when the generator is delivering rated at 0.8 p.f. lag and lead. Assume rated voltage and rated current as one per unit.</td></tr>
<tr><td>9</td><td>Explain the V and inverted V curves of a synchronous motor with neat diagram.</td></tr>
<tr><td>10</td><td>Why synchronous motors are not self-starting? Explain in detail.</td></tr>
<tr><td>11</td><td>List the various starting methods of a synchronous motor and explain in detail.</td></tr>
<tr><td>12</td><td>Describe the effect of changing field current excitation at constant load and following variable excitation. (i) Under excitation (ii) Normal excitation (iii) Over Excitation.</td></tr>
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