

ECE 3354 – Power Systems Laboratory

<p>Experiment: Synchronous Machines</p>

Date of Experiment

Month/Day/Year

Prepared By:

Author's Name

Partner's Name

Prepared For:

Instructor's Name

(Short answers, be brief and <5 lines)

Reference text book: **Electric Machinery Power System Fundamentals, Stephen J Chapma**

Experiment Introduction and Objective

(Less than 5 lines. Refer to the lab manual and **Re-Write** in your own words in bullets or numbering format).

Part I – Synchronous Motor and Power Factor Correction

Starting of a Synchronous Machine (motor)

Describe how to start the synchronous motor in our experiment. What is the major function of the DPDT switch used in our experiment? What is the synchronous speed of the motor? How many poles does it have?

Power Factor

What did you observe in this part? Include any table, data and plots here.

How is the phase angle and power factor calculated from the data collected?

Describe the capability of a synchronous motor to control the power factor seen by the supplying power system. See Table 1. (Short answers, be brief and <5 lines)

(Refer to the textbook pp 240-243 and the experiment results, answer it in your own words)

Answer here.

Torque capability.

What does the *Stall* mean to a synchronous machine?

Explain the impact of field excitation (I_f) on torque capability. Relate it to the fundamentals. See table 1.

(Examine equations listed on page 4-8 in the lab manual to figure out the answer. For more information about these equations, please refer to the Reference Book -1 listed in the lab manual. MMF is the abbreviation of MagnetoMotive Force)

Answer here.

V-Curves

What did you observe in this part? Include any **table, data and plots**.

Draw the motor V-curves from the data captured, and explain the system aspects of the characteristic described by the curves. See Figure 11 and Table 2.

(refer to textbook pp 235-240 to organize your explanation. We did not get a whole V-curve in our experiment, you need to give a general idea about the effect of field current on a synchronous motor with different amounts of load applied)

Place plot and your explanation required here.

Part II – Synchronous Generator

Open-Circuit test Experiment

Explain what this part was for. Include Open-circuit Characteristic plot (E_a vs. I_f). Comment on this plot.

Short-Circuit test Terminals Experiment

Explain what this part was for. Include the Short-circuit Characteristic plot (I_a vs. I_f). Comment on this plot.

Armature Resistance- R_a

State why you measured this. And what is the Skin effect?

How will it influence the AC resistance comparing to the DC resistance?

Draw the Open-circuit and Short-circuit characteristic. Derive and draw the per-phase equivalent of the synchronous machine. See Figures 9b and 12, also Tables 3, 4, and 5.

(Pay attention to the Skin effect, and how to find the AC resistance from the DC resistance calculated)

Place derivations and schematic here, not just your answers.