KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
ELECTRICAL ENGINEERING DEPARTMENT
EE-462 ELECTRICAL MACHINES

Term: 012

Experiment # 5
X_d and X_q PARAMETERS OF SYNCHRONOUS MACHINES BY SIMULATION — EDSA SOFTWARE

INTRODUCTION

To start with the EDSA program, click on **synchronous machine parameters**, then
Analysis icon ⇒ Rotating Machines ⇒ Synchronous
Then, create a new file by clicking on **File ⇒ New**
To start entering the data, click on **Enter General Data**
(enter machine ID, description, rated voltage, and rated 3-phase KVA) then minimize.

DATA ENTRY

Click on **View ⇒ AC resistance**
(enter the DC resistance and the operating temperature)
Click again on **View ⇒ D-Axis X SCR**
(enter the air gap data and the field current data)
Press **space bar** to get results
Again Click on **View ⇒ D-Axis Saturated X**
(the air gap data are automatically inn)
Enter rated current / zero PF data point and field current and line voltage.

- To enter open circuit characteristics data: **Press Add** and **enter data**
- To delete any point: **Highlight it** and **Press delete**
- To get results: **press space bar**

Click for the third time on **View ⇒ Q - Axis (1)**
(You may enter the minimum and maximum voltage and currents from your previous lab experiment)

- To get results, **press space bar**
- To save or see the output report: Click on **File ⇒ Save** or **Output.**

Determine the parameters for the following tests:
A 15 MVA three-phase 13.8 kV two-pole 60 Hz synchronous generator was tested by the open circuit test, and its air gap voltage was extrapolated with the results as follows:

Open circuit test:

Field current	320	365	380	475	570
Line Voltage, KV	13.0	13.8	14.1	15.2	16.0
Extrapolated air gap voltage, KV	15.4	17.5	18.3	22.8	27.4

The short circuit test was then performed with the following results:

Field current, A	320	365	380	475	570

Armature current, A	1040	1190	1240	1550	1885

The zero power factor (PF) characteristics are as follows:

$I_f = 640$ A

$I_a = 1190$ A

$V = 13.8$ KV

$R_{DC} = 0.24$ Ω / phase.