Guidelines for the Assignments Reports

The report should contain the following:

1. The program code used to calculate the requirements.
2. The output values (figures) required with proper heading and axes titles.
3. Comments on the outputs.

The report should be sent by email to **tamer.m.abdo@gmail.com** as a **pdf file**. The file name should be as follows: **studentname_assig1.pdf**

For a 75-kVA, 60-Hz, 4600/240 V distribution transformer whose resistances and leakage reactances are (in ohms):

$$R_1 = 0.846,\ R_2 = 0.00261,\ X_1 = 26.8,\ X_2 = 0.0745,\ R_c = 220000,\ X_\mu = 112000$$

Write a computer program to perfrom the following:

For LV side operating at 240 V:

a. Plot the HV side terminal voltage as a function of the power factor angle at full-load as the load power factor varies from 0.6 pf leading through unity pf to 0.6 pf lagging.
b. Plot the effeciency and regulation for the same pf range at full-load, half-load and quarter-load conditions.

If the HV transformer tappings is limited to ±5%, comment on the results above.

Write a computer program to analyze the performance of a three-phase induction motor operating at its rated frequency and voltage. The inputs should be the rated motor voltage, power and frequency, the number of poles, the equivalent-circuit parameters, and the rotational loss. The program should plot the motor supply current, the output power, the input power and power factor and the motor efficiency against a range of slip staring from s=1 to s=0. Also plot the same parameters against the motor speed.

Exercise your program on a 500-kW, 4160 V, three-phase, 60-Hz, four-pole induction motor whose rated speed rotational loss is 3.5 kW and whose equivalent-circuit parameters are:

$R_1 = 0.521$ $R_2' = 1.32$ $X_1 = 4.98$ $X_2' = 5.32$ $X_m = 136$

For a 100-hp, 3-phase, Y-connected, 440-V, 50-Hz, 8-pole squirrel cage induction motor with no-load rotational loss of 2.7 kW and has the following equivalent-circuit constants all expressed in ohms/phase referred to the stator:

R_1=0.085 Ω R_2'=0.067 Ω X_1=0.196 Ω X_2'=0.161 Ω X_μ = 6.65 Ω

Write a program to draw the **torque-speed** characteristics for a slip range from 2 to -1 at:

a) Rated conditions.
b) V = 0.8, 0.6 V_{rated}, 0.4 V_{rated} and 0.2 V_{rated}.
c) f = 15 Hz, 25 Hz, 50 Hz, and 65 Hz.
d) V/f operation for f = 10 Hz, 30 Hz, 50 Hz, and 60 Hz.
e) $R_2'=2R_2'$, $R_2'=3R_2'$, $R_2'=4R_2'$ and $R_2'=5R_2'$.
f) $R_1=2R_1$, $R_1=3R_1$ and $R_1=4R_1$.

For all the above curves, determine the **operating points** if the motor is required to drive a load of 400 N.m.