BIRZEIT UNIVERSITY

Electrical and Computer Engineering Department

Electrical Machines ENEE 2408

MatLab Assignment on Induction Motors – Fall 2024

For an 10 poles, 380V, 50 Hz, Y-connected Induction motor whose parameters are given as follows, write a MatLab code to plot the torque-speed curves for "s" in the range {-1.0013, 2.0013}. Avoid running the simulation for s=0.0; use very small value for step change; delta s=0.002!

X_m=80Ω, X_1= 0.25Ω, X_2=0.3Ω, R_1= (**0.03+ 0.06*Y**)Ω, **R_2= (0.04+ 0.07*Z**)Ω ; where Y=the least significant digit in your ID, Z is the second digit of your ID; if your ID is 1984876; then R_1= (0.03 + 0.06*6)=0.39 Ω and R_2= (0.04 + 0.07*7)=0.53 Ω.

Note that, **each figure must have your Initials added to its title;** e.g.: "Torque-Speed Characteristic with different voltages by SAIR" if the student's name is "Sami Ali Imad Rezeq".

a. Show the torque plot versus speed and also the torque versus "s" at rated voltage, **also show the converted output power versus slip.**

b. Show the Input current plot versus speed and also the input current versus "s" at rated voltage**.**

c. Repeat a) for VLL reduced to 90% of rated VLL, 75%, 60%, 45% then to 25% of rated voltage (show plots on the same figure)

d. Repeat a) for R_2 (**the one you have calculated based on your ID**) increased to have every time one of the following values: R_2, 1.6*R_2, 2.1*R_2, 3*R_2, 9*R_2, 13*R_2, 20*R_2 and 40R_2 (show plots on the same figure)

e. In what range is the value of the rotor resistor (R_2) that produces the maximum starting torque??

f. If the load is a fan, whose torque is: $\tau_{load1} = 0.02\omega_m{}^2$ then, plot the load torque and the motor induced torque on the same plot for various values of voltage (as in part **c.**), and another plot for various values of rotor added resistor (of part **d.**), comment on motor speed for all cases

g. If the load is constant, whose torque is: $\tau_{load2} = 300N.m$ then, plot the load torque and the motor induced torque on the same plot for various values of voltage (as in part **c.**), and another plot for various values of rotor added resistor (of part **d.**), comment on motor speed for all cases

h. Repeat **b**) for VLL reduced to 90% of rated VLL, 75%, 60%, 45% then to 25% of rated voltage (show plots on the same figure) with plots of the two types of torque load; $\tau_{load1} = 0.02\omega_m{}^2$, **and** $\tau_{load2} = 300N.m$.

Notes:

1- Make your figures clear with white backgrounds and thick traces! Also add text to the axes of plots, with **your name Initials added to its title**.

2- The deadline for submitting a soft copy report of the assignment (including a brief introduction, Code, plots, discussion and explanation of results, and conclusions) is on Friday 3/1/2025 before 11:55PM. Send your response as a reply message to this assignment message.