Menoufiya University
Faculty of Engineering
Shebin El-Kom
First semester examination
Academic Year: 2016-2017

Year: Master
Department: Electrical Engineering
Subject: Dynamic Analysis of Electric Machines
Time Allowed: 3 hours
Date: 8-1-2017

Allowed Tables and Charts: No

Question (1) *(25 Marks)*

(1-a) Develop a mathematical model that represents the dynamic state of the dc series motor. Draw the analogue model of the dc series motor. Neglect the saturation of the magnetic core.

(1-b) The phases of a 3-phase circuit consist of equal resistances, equal inductances and equal capacitances connected in **series**. The phases are not coupled. Drive the voltage equations in the arbitrary reference frame and draw the equivalent circuit.

Question (2) *(20 Marks)*

A 5 Kw, three phase, 4-pole, 50 Hz induction motor has full load efficiency of 85%. The total moment of inertia of rotor and connected load is 0.094 kg-m^2. The total losses of motor may be assumed 2.25 times the rotor ohmic losses. Assuming full load slip to be negligibly small, calculate:

i. The total energy losses in rotor during starting.
ii. The total energy losses in rotor during reversing if the motor is plugged.
iii. The number of times per minute that the motor can be reversed without exceeding its allowable temperature rise.

Question (3) *(30 Marks)*

(3-a) Drive the q-d axis voltage equations in different reference frames (stationary and synchronously reference frames).

(3-b) Drive the mathematical model by which the dynamic response of a balanced three phase induction motor can be predicted.

Question (4) *(25 Marks)*

(4-a) Drive a mathematical model to describe the dynamic behavior of three phase salient-pole synchronous generator, having one damper coil on the quadrature axis and one damper coil on the direct axis.

(4-b) Drive the mathematical model by which the dynamic response of permanent magnet synchronous motor can be predicted.

---------- Good Luck ----------