Kafrelsheikh University
Faculty of Engineering
Subject: **Energy Conversion**
Year: second Electrical (R. 2007)
Exam Date: 13/6/2021

Final Exam of 2nd semester-2020-2021
Department of Electrical Engineering
course code: EPM2203 Full Mark: 90 Marks
number of pages: 2 Time allowed: 3 hours

This exam measure the following LOs (a.1, a.3, b.2, b.3, b.4)

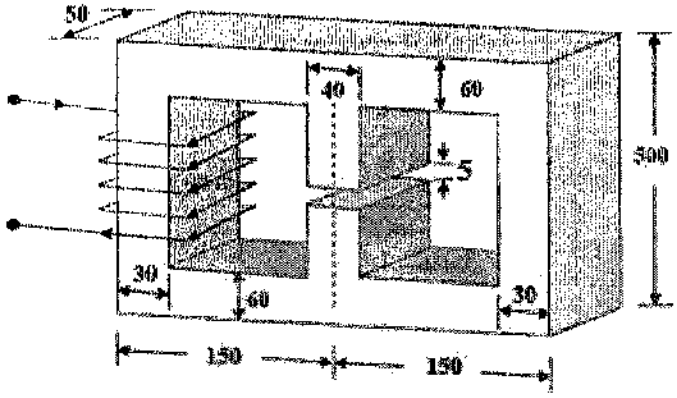
Answer the Following Questions:

Q1: (25 Mark)

a) **What** is magnetic material, **classify** magnetic materials; give one example of each class? [6Mark]

b) **What** is the operating point of permanent magnets material? Haw you can determined. [7Mark]

c) In the magnetic circuit shown below with all dimensions in mm, **calculate** the required current to be passed in the coil having 300 turns in order to establish a flux of 2.28 mWb in the air gap. Consider the fringing effect at the air gap by 7% and the relative permeability of the core is 4000. [12Mark]

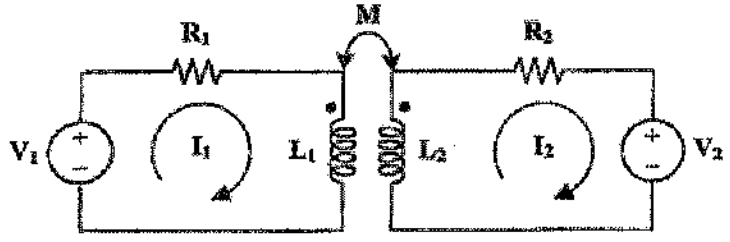


Q2: (20 Mark)

a) **Define** the Reflected Impedance for Linear Transformers and drive its equation [5Mark]

b) **what** is the deference between Conductively coupled circuit and Magnetically coupled circuit? [5Mark]

c) Given the circuit in figure below, $V_1 = V_2 = 10$ V, $R_1 = R_2 = 10\ \Omega$, $\omega L_1 = \omega L_2 = 10\ \Omega$, and $\omega M = 5\ \Omega$, **find** the coupling coefficient, k, the current in the primary and secondary circuits, I_1, I_2, and the power absorbed. [10Mark]



Q3: (25 Mark)

a) **Draw** and **explain** the inductance variation in rotating machine. [5Mark]

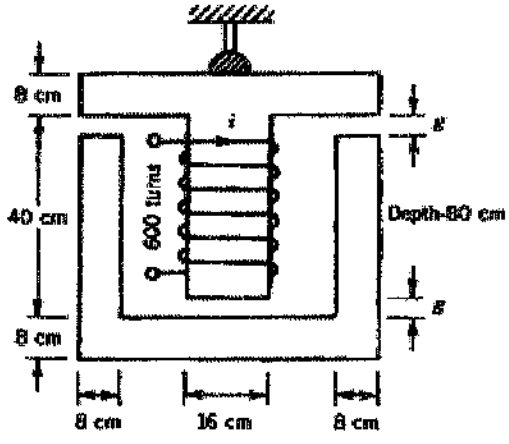
b) **Drive** the torque equation in double excited system. [5Mark]

c) Figure below shows an electromagnet system for lifting a section of steel channel. The coil has 600 turns. The reluctance of the magnetic material can be neglected up to a flux density of 1 .4 tesla.

(*i*) For a coil current of 1 5 A (dc) **determine** the maximum air gap g for which the flux density is 1.4 tesla.

(*ii*) For the air gap in part (a), **determine** the force on the steel channel

(*iii*) The steel channel has a mass of 1000 kg. For a coil current of 15 A, **determine** the largest gap at which the steel channel can be lifted magnetically against the force of gravity (9.81 m/sec2. [15Mark]



Q4: (20 Mark)

a) **Explain** the operation conditions and construction of the salient-pole reluctance motor. [8Mark]

b) **Mention** the relation between the solar power and the environment [5 Mark]

c) **Explain** the principle of operation of fuel cell, and mention the disadvantages of using fuel cell. [7Mark]

With my best wishes

Associate prof./ Mohamed I. Abdelwanis