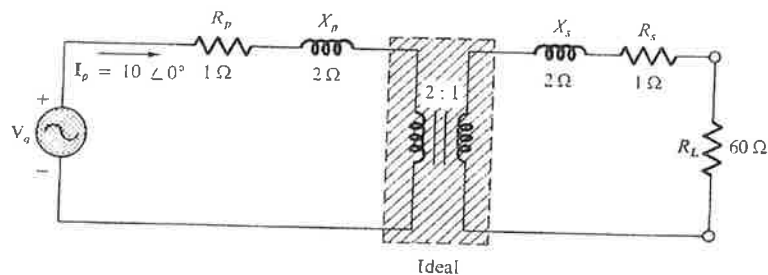


Prairie View A&M University
Roy G. Perry College of Engineering
Electrical and Computer Engineering Department
Preliminary Exam
Spring 2018

Name: _____ Student ID #: _____

- 1- For a transformer having the following equivalent circuit and primary current as indicated, determine
- Impedances referred to primary side (high side).
 - Value of supply voltage V_g .



- 2- A ferromagnetic circuit has a magnetic core with infinitely high relative permeability. It has three legs, and air gaps of 2 mm and 1 mm are cut from sections A and C as shown in the following figure. A coil is wound on the center leg B, and it has 200 turns and a resistance of 2.5 ohms. The magnetic core has a 5 x 5 cm uniform cross-sectional area. A DC voltage is applied to the coil.

DC voltage is applied to the coil.

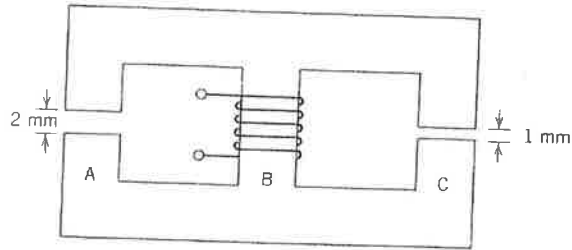
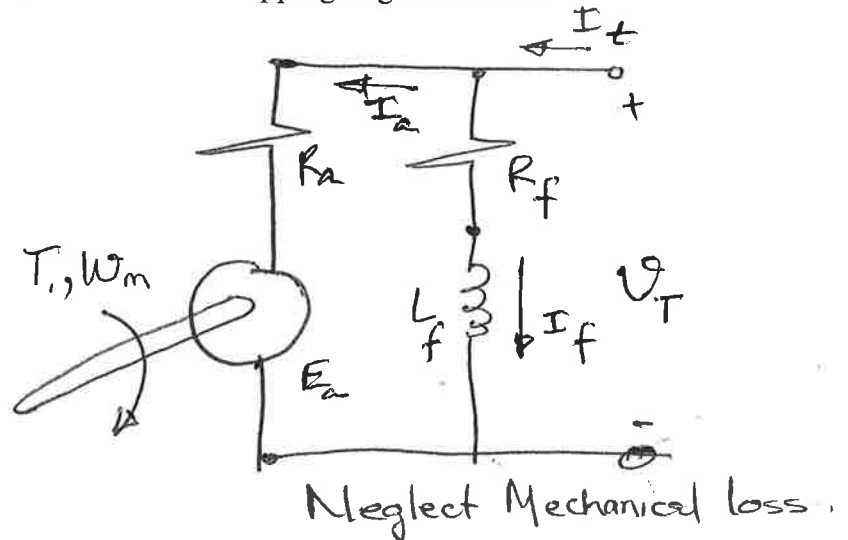


FIGURE 4.22

Determine the value of the applied DC voltage that will produce a flux density of 0.75 T in the right leg (section C).

- 3- A 120 V shunt motor has armature and field winding reistances of 0.10 and 120 ohms respectively. Neglect the voltage drop across the carbon brush. The motor operates at rated load and draws a line current of 41 A at a speed of 200 rad/s
- Calculate the field and armature currents
 - Calculate the counter EMF developed at the motor
 - Calculate the developed power in kW
 - Calculate the developed torque in N-m
 - Briefly explain the methods available for stopping large DC motors



- 4- A 15 kVA, 2300/230 V transformer was tested to by open-circuit and closed-circuit tests. The following data was obtained:

$$\begin{array}{ll} V_{OC} = 2300 \text{ V} & V_{SC} = 47 \text{ V} \\ I_{OC} = 0.21 \text{ A} & I_{SC} = 6.0 \text{ A} \\ P_{OC} = 50 \text{ W} & P_{SC} = 160 \text{ W} \end{array}$$

- Find the equivalent circuit of this transformer referred to the high-voltage side.
- Find the equivalent circuit of this transformer referred to the low-voltage side.
- Calculate the full-load voltage regulation at 0.8 lagging power factor, at 1.0 power factor, and at 0.8 leading power factor.
- Plot the voltage regulation as load is increased from no load to full load at power factors of 0.8 lagging, 1.0, and 0.8 leading.
- What is the efficiency of the transformer at full load with a power factor of 0.8 lagging?

- 5- The following power system has two loads attached to a 6 ohm line with a supply current of values of

$P = 100 \text{ W}$ at 0.8 pf leading

$P = 1000 \text{ W}$ at 0.7 pf lagging

- Determine the value of the total watts, vars and volt amperes for the circuit
- Value of the supply voltage E
- Power factor for the circuit
- Type of element and their impedance in each box

