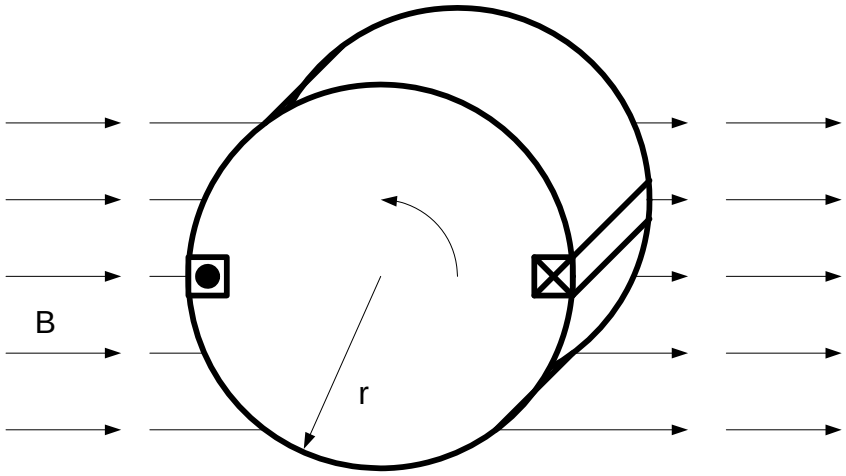
ECE 320 / ECE 329 NAME _____

Quiz 6 2 March 201

Introduction to DC Machines

1. (6 points) A 0.2 meter long conductor inside a rotor with a 0.1 meter radius rotates counterclockwise at an angular velocity of 200 radians/second in a uniform, constant magnetic field of 0.25 Wb/m^2 directed into the page. The conductor returns on the other side of the rotor.
   a. (3 points) Determine the magnitude of the induced voltage.



$B := 0.25 \cdot \frac{Wb}{m^2}$ $\omega := 200.0 \cdot \frac{rad}{sec}$ $ll := 0.2 \cdot m$ $r := 0.1 \cdot m$ $sides := 2$

$voltage := sides \cdot (\omega \cdot r \cdot B) \cdot ll = 2\ V$

b. (3 points) The conductor is connected to a 0.05 Ohm resistor. For the voltage that you found in part a and the current direction as shown, determine the magnitude and direction of the induced torque. If you didn't find a voltage in part a, make one up.

$R_X := 0.05 \cdot \Omega$ $voltage = 2\ V$ $I := \frac{voltage}{R_X} = 40\ A$

$force := B \cdot ll \cdot I = 2\ N$

$torque := sides \cdot r \cdot force = 0.4 \cdot N \cdot m$ Clockwise

2. (4 points) For the electric motor shown on the video monitor, identify the parts of the machine indicated.

   A. _____Commutator_____

   B. _____Armature windings_____

   C. _____Field magnets_____

   D. _____Rotor slots_____