ElectroMagnetism: Force on a Wire, Torque on a Loop and Motors

1. Find the magnitude and direction of magnetic force on the segment of wire shown:

4.0A

X X X X X

0.25T

X X X X X

X X X X X

X X X X X

X X X X X

X X X X X

0.10m 0.16m

0.20m

2. The diagram shows a cross section of a wire carrying a 0.40A current into the paper. There exists a magnetic field parallel the plane of the paper.

As a result of this field the wire experiences a force equal to 0.048N upward on a 10.0cm section of its length. Determine the magnitude and direction of the magnetic field.

3.An electric motor has a circular loop with r=0.012m and 750 windings. The resistance of the loop is 24Ω and it is connected to a 120V power source. The loop is completely within a 0.25T magnetic field. Find the torque on the loop when

A) the loop’s area is a) parallel to the field

b) at 33o to the field

c) perpendicular to the field

B) the normal to the area is a) parallel to the field

b) at 33o to the field

c) perpendicular to the field

4. The following device is a (very) simplified version of a ‘current balance’, and it is simple model of how a digital scale operates. If enough, but not too much, current flows in the coil the mass will be balanced. By measuring the current, the mass is determined.

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The coil measures 3.0cm by 4.0cm (4.0cm being the length into the paper) and consists of 1500windings. The magnetic field is 0.10T. The mass is balanced when 150mA of current passes through the coil.

A. Find the mass.

B. What is the direction of the current?