THE CITADEL
THE MILITARY COLLEGE OF SOUTH CAROLINA

Department of Electrical and Computer Engineering

ELEC 318 Electromagnetic Fields **HW #6, due March 12th, 2015**

Reading Assignment: Chapter 5 (all)

Written Assignment:

1. A square conducting loop with sides 40 cm long lies in the $z = 0$ plane and carries a current of 8 A in the counterclockwise direction (viewed from above).

   Determine the magnetic field intensity at the center of the loop.

2. The $z = 0$ plane carries a surface current of $10\,\hat{\mathbf{x}}$ A/m, while a thin filament situated at $y = 0$, $z = 6$ m carries a current I in the $+x$ direction.

   Solve for I such that the magnetic field intensity at (0, 0, 3 m) is zero.

3. An infinitely-long cylindrical conductor of radius a is placed along the z axis.

   The current density in the conductor is $\frac{J_0}{r}\hat{\mathbf{z}}$ (where J_0 is a constant).

   Determine the magnetic field intensity everywhere.

4. A magnetic flux density in space is $4\,\hat{\mathbf{x}} - 8\,\hat{\mathbf{z}}$ Wb/m^2 .

   Determine the force that this flux density exerts on a 20-cm-long conductor on the y axis carrying a current of 2 A in the $-y$ direction.

5. A conducting triangular loop carrying a current of 2 A is located close to an infinitely long, straight conductor carrying a current of 5 A, as shown in the figure. ($\mu = \mu_0$)

   Determine… (a) the force on side 1 of the triangular loop, and
   (b) the total force on the loop,
   …due to the infinitely-long current-carrying conductor, only.