Heriot-Watt University
Department of Computing and Electrical Engineering
22.3MB1 Electromagnetics 2001-2002
MATLAB Assignment 1

Use MATLAB to determine the distribution of magnetic flux density B(T) in the region of free space surrounding a straight current-carrying conductor of finite length. Apply the Biot-Savart Law to evaluate B(T).

Assume that the conductor is 5m long and that it carries a direct current of 1A. Compute the magnetic field at grid points over an area of 20m x 15m, with the conductor at the centre of the grid, lying along the 20m direction.

Using MATLAB 'for....end' loops, 'meshgrid', 'contour' and 'subplot' commands, compute and plot the following variations:

- B(T) over X,Y.
- B(dBnT) i.e. B(dB re 1nT) over X,Y.
- Contours of B(T) over X,Y.
- Contours of B(dBnT) over X,Y.

Revision of the Biot-Savart Law, and further guidance on this assignment, including typical examples of MATLAB code, will be given in class.

After gaining some familiarity with MATLAB it is suggested that you experiment with 'for…..end' loops as a logical first approach to evaluating the function over ranges of X and Y values. An alternative approach is to use 'meshgrid' to fix the range of values of X and Y, this leading to a more efficient and compact form of code, starting for example as follows:

```
x=linspace(-7.5, 7.5, 30);      % 30 x points between –7.5 and +7.5
y=linspace(-10, 10, 40);        % 40 y points between –10 and +10
[X,Y]=meshgrid(x,y);            % a 2D array of x and y points
(Now write code to evaluate the Biot-Savart function.)
```

Your report should contain the following detail, as a minimum.

1. A description of the mathematics involved, referring to an appropriate textbook.
2. A printout of your MATLAB code, with descriptive comments beside each line of code.
3. A group of four subplots, as described above.

The completed assignment should be submitted to the student office by **Monday 29th October 2001.**

rmd/12-09-2001