Elex 7530: Experiment Number – 4:

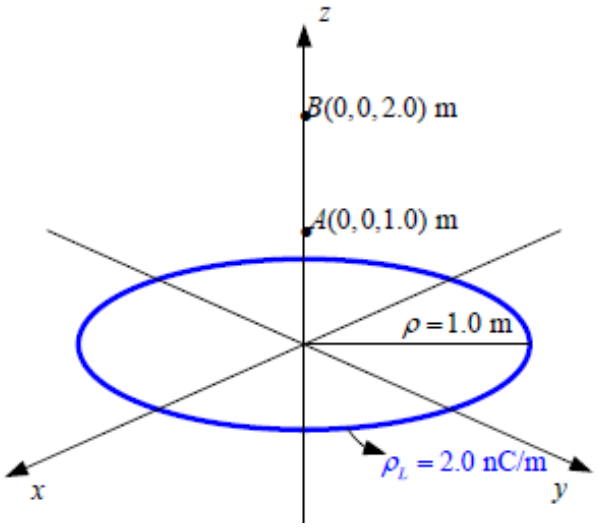
Solving electromagnetics Problems using Matlab

Your report must have the following:

1. Analytical Solution.
2. A Matlab solution.
3. .m file to be executed.
4. Your Lab uploaded in share-in folder of ELEX7530.
5. Deadline: 28th November 2016 for both 5S and 5T.

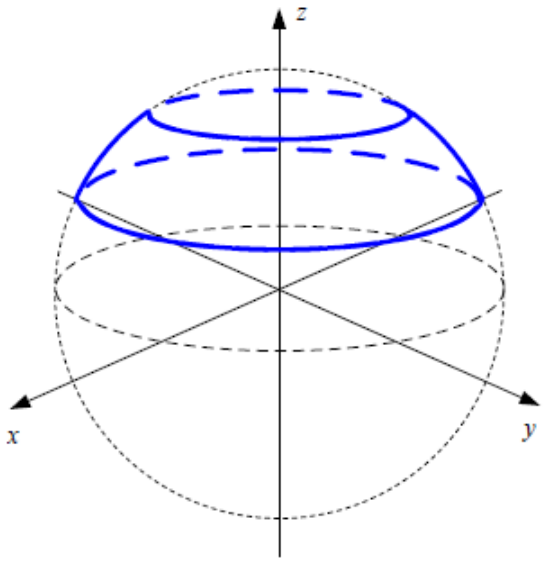
Problem-1: ***{Expected Answer = 29.4 V}***

A ring linear charge with a charge density $\rho_L = 2.0\frac{nC}{m}$ is located on the x-y plane as shown in the diagram. Find the potential difference between point A(0, 0, 1.0) and point B(0, 0, 2.0). Write a MATLAB program to verify your answer.



Problem-2: ***{Expected Answer = 77.42 A}***

Let $\boldsymbol{J} = \frac{400\sin(\theta)}{r^2+4}\, a_r \frac{A}{m^2}$. Find the total current flowing through that portion of the spherical surface $r = 0.8$, bounded by $0.1\,\pi < \theta < 0.3\pi$ *and* $0 < \varphi < 2\pi$. Verify your answer using Matlab program.



Problem-3: ***{Expected Answer* = $\mathbf{4.503 * 10^{-10}C}$}**

A parallel-plate is filled with a non-uniform di-electric characterized by $\epsilon_r = 2 + 2 * 10^6\ x^2$, where x is the distance from the lower plate in meters. If $S = 0.02\ m^2\ and\ d = 1.0mm,$ find the capacitance C. Write a MATLAB program that finds the energy stored in this capacitor if the charge on the positive plate is $Q = 4.0 *\ 10^{-9}\ C$. Use the formula $W_E = \frac{Q^2}{2\ C}$ to evaluate the capacitance and compare your results.