Extra Credit
Final Exam Review

1. For a Teflon insulated coaxial cable with a circular center conductor (diameter = 2mm) and a square outer conductor (6.2mm by 6.2mm), what is the characteristic impedance, the propagation velocity and the average surface charge density on the inner conductor? The voltage on the inner conductor is 10 V and the outer conductor is grounded. *Hint: Use AppCAD*
   a. $Z_o = 50\Omega \;\; u = 0.69c \;\; \rho_S = 7.69e-8$
   b. $Z_o = 100\Omega \;\; u = 0.69c \;\; \rho_S = 7.69e-8$
   c. $Z_o = 50\Omega \;\; u = 0.69c \;\; \rho_S = 1.54e-7$
   d. $Z_o = 100\Omega \;\; u = 0.51c \;\; \rho_S = 7.69e-8$
   e. $Z_o = 100\Omega \;\; u = 0.51c \;\; \rho_S = 1.54e-7$
   f. $Z_o = 100\Omega \;\; u = 0.69c \;\; \rho_S = 1.54e-7$

2. An inductor is constructed by wrapping 1000 turns of wire in a single layer around a hollow iron pipe. The inner diameter is 2cm, the outer diameter is 3cm, and the length of the pipe is 20cm. The relative permeability of the iron is 1000. Find the inductance of this configuration.
   a. $L = 0.25H$
   b. $L = 2.5H$
   c. $L = 10H$
   d. $L = 5H$
   e. $L = 7.5H$
   f. $L = 0.5H$

3. Typical properties of aluminum foil can be found at http://www.azom.com/details.asp?ArticleID=1435 If a standard roll of aluminum foil (18" wide and 500 feet long) is unrolled to form a long thin conductor, determine its resistance.
   a. $R = 100\Omega$
   b. $R = 40\Omega$
   c. $R = 1\Omega$
   d. $R = 0.4\Omega$
   e. $R = 0.1\Omega$
   f. $R = 0.04\Omega$

4. If the transmission line of question 1 is 100 meters long, and a load of 100 Ohms is connected to its output end, what is the input impedance of the line at a frequency of 50MHz?
   a. $Z_{IN} = (23 - j33)\Omega$
   b. $Z_{IN} = (33 + j23)\Omega$
   c. $Z_{IN} = 50\Omega$
   d. $Z_{IN} = (33 - j23)\Omega$
   e. $Z_{IN} = (23 + j33)\Omega$
   f. $Z_{IN} = 100\Omega$

5. For a uniform plan wave incident in air on glass (relative permittivity equals 6), at what polarization and angle of incidence will half the incident electric field be reflected?
    a. Perpendicular pol: 45 degrees; Parallel pol: 30 degrees
    b. Perpendicular pol: 83 degrees; Parallel pol: 37 degrees
    c. Perpendicular pol: 37 degrees; Parallel pol: 83 degrees
    d. Perpendicular pol: 17 degrees; Parallel pol: 37 degrees
    e. Perpendicular pol: 17 degrees; Parallel pol: 83 degrees
    f. Perpendicular pol: 30 degrees; Parallel pol: 45 degrees

6. An electron beam with a radius of 1mm has a voltage on axis of -100V, assuming that the voltage at its outer edge is zero. What is the volume charge density in the beam?
    a. $\rho_v = -.53$
    b. $\rho_v = -.0035$
    c. $\rho_v = -.035$
    d. $\rho_v = -.0053$
    e. $\rho_v = -.35$
    f. $\rho_v = -.00053$

7. A pulsed voltage source produces a 10V, 1 microsecond pulse at the input of a lossless transmission line. If the source and load impedances are both 50 Ohms, what is the characteristic impedance of the line if the first pulse observed at the load is 4 V?
    a. $Z_o = 100\Omega$
    b. $Z_o = 90\Omega$
    c. $Z_o = 150\Omega$
    d. $Z_o = 120\Omega$
    e. $Z_o = 130\Omega$
    f. $Z_o = 80\Omega$

8. In a standard 100 meter long RG58 coaxial cable, 95% of the input power is observed at the load end. What is the decay constant α for this cable?
    a. $\alpha = 2.56e - 2$
    b. $\alpha = 2.56e - 4$
    c. $\alpha = 5.12e - 2$
    d. $\alpha = 5.12e - 4$
    e. $\alpha = 1.28e - 4$
    f. $\alpha = 1.28e - 2$