EE351 / Fall 2004	Home work # 4	Due: Wednesday 9/23/04

I. Text Book::

Chapter 10: problems 43, [(b) time avergaed power]
Chapter 12: problems 1, 2, 6

II:

(1) A plane wave is normally incident on a planar ineterface between air and muscle. The conductivity and dielectric constants of muscle are σ_m =0.889 S/m and ε_r=71.7. The intrinsic impedance of a conducting (or lossy) medium such as muscle or fat is given by:

$$\eta_c = \frac{\sqrt{\mu/\varepsilon}}{\left[1 + \left(\frac{\sigma}{\omega\varepsilon}\right)^2\right]^{1/4}} e^{j\left(\frac{1}{2}\right)\tan^{-1}\left[\sigma/\omega\varepsilon\right]}$$

Determine the percentage of incident power absorbed by the muscle tissue at:
(a) 100 MHz , (b) 300 MHz, (c) 915 MHz, (d) 2.45 GHz.

Repeat (a) – (d) if muscle is replaced by Fat (σ_f = 0.155 S/m and ε_r=71.7)

(2) The electric field associated with a uniform plane wave propagating in air is given by:

$$\mathbf{E}_i = 1000 \cos(10^8\pi t - \beta_o z)\, \mathbf{a}_x$$

The wave is normally incident on a dielectric medium (σ_d = 0, and ε_d=5 ε_o , μ_d = μ_o).
Determine the following:
(a) β_o in air and β_d in dielectric material.
(b) Reflection and trasmission coefficients
(c) Amplitudes of the reflected and transmitted E and H fields.
(d) Refelected and transmitted power.