Land Remote Sensing Homework #1, Aug 26, 2015 Due: Sept 14, 2015

If you need more space to explain your answers, then please write on the back of the page, or attach additional pages.

1. A small object is emitting Q watts of radiant power isotropically in space. A circular collector of aperture area A is located at distance D from the emitter. What diameter collector would be needed to intercept 0.10 microwatts of power with D = 1000 km and Q = 1 kilowatt?

2. Calculate the ratio of the spectral radiances of black bodies at 300 K and 6000 K at (i) a wavelength of 0.1 μ m, (ii) a wavelength of 1 μ m, (iii) a frequency of 1000 GHz, and (iv) a frequency of 1 GHz. Comment on your results.

3.	At what wavelength does your body's thermal emission peak? Assume you are a healthy 98.6°F, and ignore spectral variations in your emissivity.
4.	Randomly polarized radiation at a wavelength of 3 cm is incident on a plane water surface at an angle of 83° to the normal. The dielectric constant of water at 3 cm is 63.1-32.1i. Calculate the reflection coefficients for parallel and perpendicular polarizations. How would you describe the polarization of the reflected radiation?
5.	Consider a 5 mW He-Ne laser beam at 0.6328 micrometers wavelength that passes through a cloud of 10 m thickness. The beam is directed at 30° from normal to the cloud Calculate the absorption coefficient if the power transmitted through the cloud is measured to be 1.57576 mW. Repeat for a transmitted power of 0.01554 mW.

6.	Explain why wet sand appears darker (has a lower albedo) than dry sand.
7.	Familiarize yourself with some publicly available terrestrial data and the sensors that
	acquire them. Some sites to start with include:
	• http://science.nasa.gov/earth-science/missions/
	• https://earth.esa.int/web/guest/missions/esa-operational-eo-missions
	• http://earthexplorer.usgs.gov/
	Now, using these and other websites, investigate the technical (performance)
	specifications of Landsat 7 vs. SPOT-5, two commonly used surface remote sensing
	instruments. Regarding resolution and coverage, what are advantages and disadvantages

of each? Describe an application for each satellite for which it is clearly more appropriate

than the other.