ECS275 Midterm Fall 2011

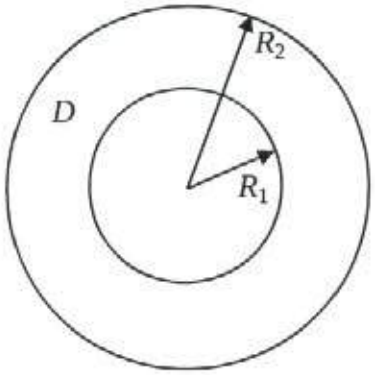
Open book, open notes, no electronic devices.

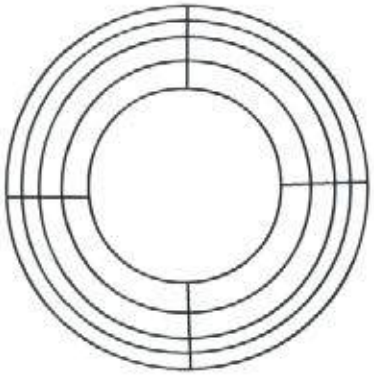
(Calculations may be left with the final arithmetic incomplete.)

Total 25 points in final course grade. Answer on separate paper and keep this question page, since I will give you the solutions when you turn in your answers.

1) (a) (2 points) Give the definition of radiosity.
(b) (2 points) Give the definition of radiance.
(c) (2 points) If a point x on a perfectly diffuse surface has radiance L in all directions, what is the radiosity at x?

2) Suppose a circular fluorescent tube lies behind an annular perfect diffuser D, the area between an inner radius R_1 and an outer radius R_2.





(a) (5 points) Show how to sample a point uniformly inside the annulus D, *i. e.* with a constant probability density per unit area. (Hint: this is related to choosing a uniformly distributed sample on a circular lens, except that the center region of the lens is excluded.)
(b) (5 points) Show how to how to chose 16 jittered samples, each uniformly distributed in one of the 4 by 4 (supposedly) identical-area regions shown at the right.

3) Suppose an empty cubical enclosure 1 meter on a side has its 6 inner surfaces covered with LEDs which diffusely emit 100 watts of light each, with equal radiance at all positions and in all directions. Suppose that in addition to this emission, the LED surfaces are perfectly diffuse reflectors, reflecting 80% of the flux that hits them, with equal radiance in all directions.

(a) (5 points) What is the total radiosity of each surface, counting both emission and reflection?
(b) (4 points) What is the total radiance of each surface, counting both emission and reflection?