Student ID : _____ Name : _____

CS580 Computer Graphics
2016 Ph.D. Qualifying Exam

Questions	Score
1	
2	
Total	

Radiosity (/ 50 pts)

1. What are two assumptions for the classic radiosity method? (10 pts)

2. The basic radiosity equation can be written as the following:

$$Radiosity_i = Radiosity_{self,i} + \sum_{j=1}^{N} a_{j \to i} Radiosity_j$$

Explain each term, $Radiosity_i$, $Radiosity_{self,\ i}$, N, $a_{j->i}$: (10 pts)

3. Which terms are unknown variables in the above equation? (5 pt)

4. We would like to consider reflectivity, ρ_i, of each patch *i* in the radiosity equation. Where can we place this term in the above equation? Plug the term in the above equation. (5pt)

5. Give us an overview of radiosity rendering algorithm. (10 pts)
Note: talk about only major steps.

6. Discuss pros. and cons. of the basic radiosity algorithm. (10 pts)

Rendering equations (/ 50 pts)

1. Derive the rendering equation based on hemispherical integration. (10 pts)
Note: briefly explain factors that you need to consider and derive (or show) the equation based on these factors

2. We can also represent the rendering equation based on the area integration. Transform the above rendering equation (derived based on hemispherical integration) into the one derived based on area integration. (10 pts)

3. Given the following equation, what is the Monte Carlo estimator to compute its value of the equation? (10 pts)
For this, assume that we can generate samples based on a sampling probability *p(x, y)*.

$$\mathrm{I} = \int_a^b \int_c^d f(x,y)\,dx\,dy$$

4. Show that your estimator will give the right answer on average. (10 pts)

5. What is the optimal *p(x, y)* for the estimator for the question 3? (10 pts)