CS-405+805-202510 Midterm Exam
February 27, 2025, 13:00 – 14:15, CL127
D. Hepting

This is a closed book exam. You must maintain the confidentiality of your examination; do not provide any opportunity for others to copy any of your work. Electronic devices are NOT permitted during the exam. Please turn off and put away all cell phones and other electronic devices during the exam period.

ANSWER ALL QUESTIONS. All answers must be written on this exam in the space provided. You have 75 minutes to complete the exam. Please plan your answers, favour quality over quantity, do not exceed the space provided, and do your best to write legibly. QUESTIONS ARE ON BOTH SIDES OF THE PAPER. This exam contributes 15 percent towards your final grade. There are 12 questions, all marked out of 10. The exam is marked out of 120.

Name (printed): _____

Student Number: _____

Signature: _____

***

Q1. What is sRGB and why is it important and useful? What determines its gamut? How does its gamut compare to others?

Q2. In **pbrt** geometric optics is taken to be an adequate model for the description of light and light scattering. Which basic assumptions about the behaviour of light follow from that?

Q3. What is literate programming and, aside from **pbrt**, what is an example of it that you have read about or used?

Q4. In rasterization, the loop proceeds first for each object then for each pixel and asks the question “is the pixel closer?”. How does the control loop proceed for ray tracing and what question is, or questions are, asked?

Q5. Describe the depth of field effect from (simulated) camera lenses, the circle of confusion, and defocus blur.

Q6. List the various coordinate system frames that are used in pbrt. How does one move between them? Why are matrices 4x4?

Q7. Explain how to estimate the value of π using a Monte Carlo method.

Q8. Why is spherical geometry important for rendering? What are 2 of the spherical parameterizations discussed in the book and why are they valuable?

Q9. Conceptually, how could you use a collection of bounding boxes to speed up ray-intersection tests?

Q10. Ray tracing is conceptually a simple algorithm that is based on “following the path of a ray of light through a scene as it interacts with and bounces off objects in an environment”. Although there are many ways to write a ray tracer, what objects and phenomena are simulated in all such systems?

Q11. When proceeding to render a scene with **pbrt,** of what importance are the choices for integrator and sampler? What roles do they play?

Q12. What is the purpose of bidirectional distribution functions in rendering? Why are they bidirectional? What are some forms of these functions that we have discussed and what do each of them do?