CISC 3620 SP25 Final Sample Questions

Short Response Questions:

- What does the Law of Reflection state about the angles of incidence and reflection?
- How is the angle of incidence related to the angle of reflection in a mirror?
- Why is reflection considered view-dependent?
- What is a convex polygon?
- Explain the difference between reflection and refraction.
- Why are vanishing points important in perspective projection?
- Why is the coefficient of restitution important in collision simulations?
- What does the Law of Reflection state about the angles of incidence and reflection?
- How is the angle of incidence related to the angle of reflection in a mirror?
- Why are vanishing points important in perspective projection?
- What are the two types of Oblique projections? How do they differ from one another?
- What are the two standard categories of global lighting algorithms?
- Explain Ray tracing and its two distinct concepts.
- Why is the coefficient of restitution important in collision simulations?
- Explain the role of a graphics processing unit (GPU).
- What is the purpose of a frame buffer in computer graphics?
- Define raster graphics and provide an example of its use.
- What are vector graphics, and how do they differ from raster graphics?
- What is the difference between the vertex shader and the fragment shader?
- List the six major components of a computer graphics system.
- What is the difference between absolute and relative positioning in terms of input devices? Give an example of an input device for each.
- What are the two main types of input devices mentioned in computer graphics systems?
- What is the difference between the CPU and GPU in a graphics system?
- Describe the difference between absolute and relative position input devices.
- How does anti-aliasing contribute to image quality?
- What is the difference between .gltf and .glb files when dealing with external 3D models?
- Explain the difference between additive and subtractive color models.
- What is the color gamut of a device?
- Briefly explain the role of the vertex shader in the graphics pipeline.
- List and define the five steps of a standard 3D graphics pipeline.
- What are the three necessary components that are needed to display in Three.js? Define them.
- In the following Phong shading model, identify these seven terms: **kd, Id, ks, Is, α, ka, Ia**

$$\mathbf{I} = k_d I_d \, \mathbf{l} \cdot \mathbf{n} + k_s I_s (\mathbf{v} \cdot \mathbf{r})^{\alpha} + k_a I_a$$

- What are the components that make up a 3D object in Three.js?
- What are the two types of cameras in Three.js and how do they differ from one another?
- What are the three main components of the Phong shading model, and how do they contribute to the appearance of a surface in 3D graphics?
- Create a translation matrix to move a point 3 units along the x-axis and 7 units along the negative y-axis.
- If we want to translate the vector (20,20,20,1) of 10 units in the X direction, what would the resulting matrix look like?
- Create a 4x4 matrix to scale a point by 3 in the x dimension and 0.2 in the z dimension.
- How does Percentage-Closer Filtering (PCF) help improve shadow quality?
- Explain the role of UV mapping in applying textures to 3D geometries.
- What does it mean that delta time is frame-independent?

Multiple Choice Questions:

- Which rendering technique calculates the color of each pixel individually based on lighting and material properties?

  a) Rasterization
  b) Ray tracing
  c) Vector graphics
  d) 3D modeling

- Which type of projection is often used for architectural drawings and design, where lines that are parallel in 3D space remain parallel in the projection?

  a) Perspective projection
  b) Isometric projection
  c) Orthographic projection
  d) Oblique projection

- In mathematical notation, a quaternion is represented as:

$$q = w + xi + yj + zk$$

  where w corresponds to an:

  a) Angle of incidence
  b) Angle of rotation
  c) Angle of refraction
  d) Angle of reflection

- What is the term for the process of converting 3D coordinates to 2D screen coordinates for rendering?

  a) Translation
  b) Projection
  c) Transformation
  d) Rotation

- Which term describes the technique of simulating the interaction of light with translucent materials, such as glass or water?

  a) Restitution
  b) Reflection
  c) Refraction
  d) Diffusion

- What is the primary goal of a vertex shader in computer graphics?

  a) To simulate light and shadow
  b) To compute the final pixel colors
  c) To apply textures to 3D models
  d) To transform 3D vertices into 2D screen coordinates

- Transparent objects such as glass or water are both refractive and reflective. How much light they reflect vs the amount they transmit depends on the angle of incidence. The amount of transmitted light increases when the angle of incidence:

  a) Increases
  b) Decreases
  c) Remains the same
  d) Varies depending on the angle

- In a graphical system, an array of pixels in the picture are stored in which of the following locations?

  a) Frame buffer
  b) Processor
  c) Memory
  d) All of the mentioned

- By the principle of the conservation of energy, the amount of reflected light plus the amount of refracted light is _____ the total amount of incident light.

  a) Less than
  b) More than
  c) Equal to
  d) Not dependent on

- Which term describes the effect of simulating the way light scatters within a material, creating a soft appearance?

  a) Refraction
  b) Diffusion
  c) Specular Reflection
  d) Resolution

- Which graphics technique is used to create the illusion of three dimensions on a two-dimensional surface?

  a) Isometric projection
  b) Orthographic projection
  c) Perspective projection
  d) Oblique projection

- Which term describes the process of simulating the way light scatters or bounces off surfaces?

  a) Diffusion
  b) Restitution
  c) Refraction
  d) Reflection

- If the coefficient of restitution is equal to 1, then the resulting collision is:

  a) Inelastic
  b) Elastic
  c) Partially elastic
  d) Static

- Which of the following is defined as the number of pixels stored in the frame buffer of a graphics system?

  a) Restitution
  b) Resolution
  c) Depth
  d) None of the above

- In 3D graphics, what is ‘ambient lighting’ used to simulate?

  a) Direct sunlight
  b) Indirect lighting from the environment
  c) Shadows
  d) Specular highlights

- What is the term for the process of eliminating objects or parts of objects that are outside the view frustum in 3D rendering?

  a) Culling
  b) Clipping
  c) Rasterization
  d) Ray tracing

- Which of the following best describes raster graphics?

  a) Graphics made up of lines and curves
  b) Graphics represented by pixels
  c) Graphics created using algorithms
  d) Graphics that cannot be resized

- What is the primary advantage of using vector graphics?

  a) They are easier to use than raster graphics
  b) They are resolution-independent
  c) They are faster to render
  d) They are always color accurate

- The conversion of geometric entities to pixel colors and locations in the frame buffer is known as:

  a) Rendering
  b) Ray tracing
  c) Rasterization
  d) Texture mapping

- Which of the following is not a common input device?

  a) Keyboard
  b) Mouse
  c) Monitor
  d) Joystick

- The color model that involves the mixing of light is called:

  a) Subtractive
  b) Additive
  c) Reflective
  d) Inverted

- How many colors can be displayed using an 8-bit RGB color model?

  a) 256
  b) 65536
  c) 16777216
  d) 1024

- A digital image displayed with a grid of pixels is known as:

  a) Vector image
  b) Raster image
  c) Geometric image
  d) Z-buffer image

- To define color in a raster image, which color model is typically used?

  a) CMYK
  b) HSL
  c) RGB
  d) YUV

- What RGB value represents the color black?

  a) (255, 255, 255)
  b) (0, 0, 0)
  c) (128, 128, 128)
  d) (255, 0, 0)

- How can the color white be described in terms of RGB values?

  a) (0, 0, 0)
  b) (255, 255, 0)
  c) (255, 255, 255)
  d) (128, 128, 128)

- Which of the following RGB values represents a shade of gray?

  a) (255, 128, 0)
  b) (0, 0, 255)
  c) (128, 128, 128)
  d) (0, 255, 0)

- Which of these techniques is a process where geometry that's not visible from the camera is discarded to save processing time?

  a) Culling
  b) Clipping
  c) Filtering
  d) Sampling

- Which of the following transformations is NOT a linear transformation?

  a) Scaling
  b) Rotation
  c) Translation
  d) None of the above

- Which of the following formats is specifically designed for vector graphics?

  a) WebP
  b) PNG
  c) SVG
  d) GIF

- What does the term 'anti-aliasing' refer to?

  a) Adjusting brightness in images
  b) Reducing jagged edges in graphics
  c) Compression of image files
  d) Creating textures for 3D models

- Which material in Three.js would you use for a surface that should reflect light and appear shiny?

  a) MeshBasicMaterial
  b) MeshNormalMaterial
  c) MeshPhongMaterial
  d) MeshLambertMaterial

- What does the dot product of two vectors indicate when it equals zero?

  a) The vectors are equal
  b) The vectors are orthogonal (perpendicular)
  c) The vectors point in the same direction
  d) The vectors point in opposite directions

- In a graphics pipeline, rasterization is the process of:

  a) Mapping 3D coordinates to 2D space
  b) Converting images from raster to vector
  c) Breaking down 3D objects into pixels
  d) Transforming model data into vertex data

- In Three.js, how do you set the background color of a scene?

  a) scene.color = "blue";
  b) scene.background = new THREE.Color("blue");
  c) scene.setBackgroundColor("blue");
  d) scene.addBackground("blue");

- How does ambient light affect a scene?

  a) It creates sharp shadows
  b) It adds light without direction or intensity
  c) It reflects off surfaces
  d) It creates a focal point

- Which of the following describes a characteristic of raster graphics?

  a) They use geometric shapes like lines and circles.
  b) They are resolution-independent.
  c) They are made up of a grid of pixels.
  d) They require less memory than vector graphics for complex images.

- What is the primary disadvantage of using Supersampling Anti-Aliasing (SSAA)?

  a) It is the cheapest method
  b) It is computationally intensive and can heavily load the GPU
  c) It is only effective on high-resolution displays
  d) It cannot smooth edges effectively

- FXAA stands for:

  a) Fast Analysis Anti-Aliasing
  b) Fast Approximate Anti-Aliasing
  c) Fine Adjustment Anti-Aliasing
  d) Full Anti-Aliasing Extension

- Multi-Sample Anti-Aliasing (MSAA) primarily samples multiple points:

  a) Throughout the entire pixel
  b) Only at the edges of polygons
  c) Across all subpixels
  d) At random positions in the image

- CSAA improves on MSAA by:

  a) Reducing the number of color samples while increasing coverage samples
  b) Allowing for higher resolution color samples without increasing memory usage
  c) Increasing the number of coverage samples without significantly increasing the number of color/depth samples
  d) Eliminating color samples altogether