Class Test 4 January 2025

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY

Department of Computer Science and Engineering

L-4/T-1 CSE 409: Computer Graphics

Time: 25 minutes **Marks: 20**

Student Name: _____ Student ID: _____

1. What is the formula for the half-way vector in the Blinn-Phong model? (1)

   A. $\frac{\vec{L}+\vec{V}}{2}$ B. $\frac{\vec{L}+\vec{H}}{\sqrt{2}}$ C. $2(\vec{L}\cdot\vec{N})\vec{N}-\vec{L}$ D. $\frac{\vec{L}+\vec{V}}{|\vec{L}+\vec{V}|}$

2. Ambient light is an approximation of — (1)

   A. Global illumination B. Path tracing C. Shadows D. Reflection

3. For the softest edges, we should use spot light falloff exponent $e =$? (1)

   A. 0 B. 2 C. 10 D. 20

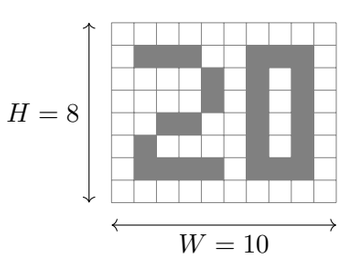
4. Which type of camera preserves distances? (1)

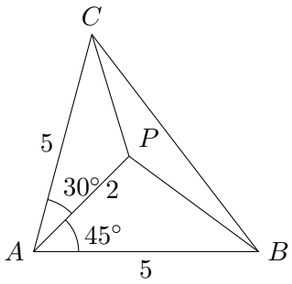
   A. Pinhole B. Simple field C. Fisheye D. Orthographic

5. Which is not a feature of the simplified pinhole camera? (1)

   A. Non-inverted image B. Perspective distortion C. Depth of field effect D. Unrealizable

6. Same triangle again! But now we want to texture it with an image. The (u, v) coordinates of the vertices A, B and C are $(0, 0)$, $(1, 0)$ and $(0.5, 1)$ respectively.





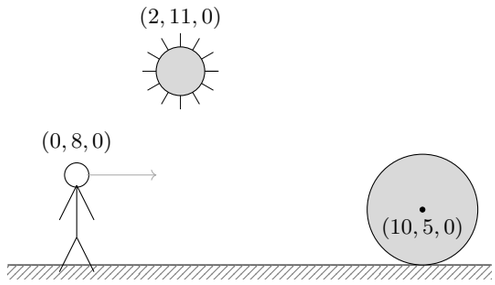
   (20, 20, 20)

   (200, 200, 200)

   a) What is the colour of P using nearest neighbour interpolation? (3)

   b) What is the colour of P using bilinear interpolation? (3)

7. As a game developer in Iron studio, you are working in a new level of a game. There is just a strange ball at $(10, 5, 0)$ of radius 5 and a point light at $(2, 11, 0)$.
After much thought, you have decided the following parameters using the Phong model:



- Point light intensity $\mathbf{I} = (20, 20, 20)$
- Ambient light $\mathbf{I}_a = (0.1, 0.1, 0.1)$
- Ambient Coefficient $\mathbf{k}_a = (0.1, 0.1, 0.1)$
- Diffuse Coefficient $\mathbf{k}_d = (0.4, 0.4, 0.4)$
- Specular Coefficient $\mathbf{k}_s = (0.5, 0.5, 0.5)$
- Shininess $n = 10$

But your game designer says the scene doesn't look right. She says the ball should be bluish gray in shadow [rgb(0,10,20)]. She also says the material should be less shiny. When the character at $(0, 8, 0)$ looks straight ahead (in the direction of x), he should see a gray colour [rgb(115,125,135)].

(**Hint:** Normalize RGB colours to $(0, 1)$ range.)

a) As per your game designer's requirement, what should be the value of the ambient coefficient $\mathbf{k}_a$? (3)

b) What should be the value of shininess n? (3)

8. For your hard work and attending the exam so early in the morning. (3)