

Aids: None**Instructions**

The exam consists of 10 questions. The number of points awarded for each correct answer is stated next to the corresponding question. The maximum score is 22. To pass the exam, you need at least 13 points.

Read the questions carefully before answering and remain calm. Please write legibly in English – answers that I cannot understand will receive 0 points! Feel free to use figures/sketches to complement your written explanations.

Good luck!

Question 1 (2p): Describe preferably with a sketch what this *WebGL* code will produce. Only the most important part of the code is included.

```
...
vertices = [ 0,0,0  0,1,0  -1,0,0,
             0,0,0  1,0,1  0,-1,0 ];
...
colors = [ [ 0.0, 0.0, 0.0, 1.0],
           [ 1.0, 1.0, 1.0, 1.0] ];
...
mat4.translate(mvMatrix, [ 0.0, 0.0, -5.0 ]);
mat4.rotate(mvMatrix, 45*Math*PI / 180, [0, 0, 1]);
...
gl.drawArrays(gl.TRIANGLES, 0 ,6);
...
```

Question 2 (2p): Describe the differences between *local illumination* and *global illumination* algorithms.

Question 3 (2p): What is the *depth buffer*? How does it differ from a *color buffer*? Explain how a depth buffer can be used in real-time graphics.

Question 4 (2p): What is *normal mapping*? Explain how it works.

Question 5 (3p): The *Phong* reflection model is a sum of three terms, each modeling a specific type of light reflection. Name and describe the three terms.

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Question 6 (1p): Describe one important principle for creating natural looking movement in animation.

Question 7 (2p): Describe the difference between *key-frame animation* and *inverse kinematics*.

Question 8 (2p): Why is the *rainbow color map* often a poor choice for encoding data in visualization?

Question 9 (2p): What is a *diverging color map* and what are the benefits of using it for visualization?

Question 10 (4p): Explain the difference between *nominal*, *ratio*, *interval* and *ordinal* data.

END