Ankara University
COM337
Computer
Student Nam
Student Numb

Department of Computer Engineering
30/12/2019
Final Examination
Duration: 80 minutes

PART I – [5 points each – Total 35 points] Multiple Choice Questions

Q1. The distortion of information due to low-frequency sampling (undersampling) is known as
A) Sampling (B) Aliasing C) Filtering D) Anti-aliasing

Q2. In 2D, reflection of a point with respect to x-axis, followed by a counter-clockwise rotation of 90°, is equivalent to reflection with respect to which line below?
A) x+y=1 B) x=-y C) y=x (D) y=-x

Q3. Aspect ratio is generally defined as...
(A) Width / Height
B) Height x Width
C) Height / (Width + Height)
D) Width / (Width x Height)

Q4. In _____ mode the application requests input and waits for it.
A) request (B) event C) sample D) constraint

Q5. _____ is a method where we combine 3D shapes using set operations to obtain new shapes.
A) Sweep representation
B) Ray casting
C) Beam penetration
(D) Constructive solid geometry

Q6. A triangle fan that has 10 triangles uses ____ vertices.
(A) 10 B) 30 C) 11 D) 12

Q7. Sutherland-Hodgeman algorithm works well for _____.
A) Concave polygons
(B) Convex polygons
C) Curves
D) Line segments

PART II – [Total 65 points] Written Answer Questions

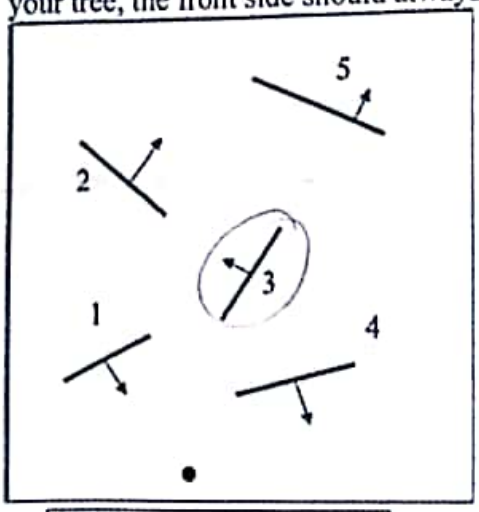
Q8. [10 points] What are the necessary commands in WebGL to use z-buffer (depth buffer) for visible surface detection (hidden surface removal)? Write the commands clearly and describe/show where each command will appear in a program.

Q9. [10 points] What are the graphics primitives that we can use in WebGL?

Q10. [12 points] In this question you will write a simple vertex shader and fragment shader code. The vertex shader will take (in addition to the position/vPosition atribute) a uniform variable called index and pass it to the fragment shader. In the fragment shader, you will make the fragment green if the index is even and gray otherwise.

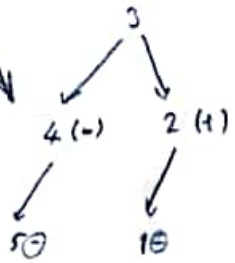
Q11. [14 points]

a. [9 points] Construct the binary space partition (BSP) tree for the scene shown below adding the objects to your tree in numerical order. The front side of each shape is shown with an arrow. In your tree, the front side should always be represented with the right sub-tree.

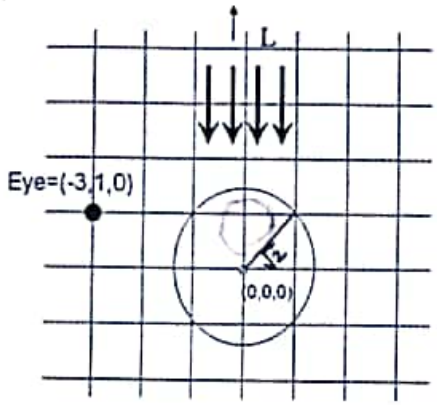


View of scene from above

b. [5 points] If the small circle near the bottom of the figure is the location of the camera, what will be the rendering order (the correct traversal) using your tree.



Q12. [10 points] The scene below shows a sphere of radius $\sqrt{2}$ centred at the origin. There is only a directional light in the scene towards the direction (0, -1, 0) as shown. The eye location is at (-3, 1, 0).



(i) At what point (coordinates) on the sphere will we get maximal specular reflection? Explain your answer.

(ii) At what point (coordinates) on the sphere will we get maximal diffuse reflection? Explain your answer.

Q13. [9 points] Assume that we have the building model shown on the left below and its center is at coordinates (-2, 3, -3). Write the lookAt(eye, at, up) function by giving specific values for its parameters to obtain the picture on the right.