杭州电子科技大学学生考试卷（ A ）卷

考试课程	计算机图形学原理	考试日期	年 月 日	成 绩	
课程号		教师号		任课教师姓名	
考生姓名		学号（8 位）		年级	专业

Part I. Multiple choice questions. Each question has only one correct answer. Please mark that one answer clearly on the answer sheet provided. If any question has more than one answer filled in, it will be marked wrong. There are 10 questions, each worth 4 marks.

1.Who is the father of computer graphics? (general)
A. Ivan E. Sutherland B. Pierre Bézier C. Steven A. Coons D. Bui-Tuong Phong

2. Given an explicit circle equation $y = y_0 \pm \sqrt{r^2 - (x - x_0)^2}$, where $\begin{bmatrix} x_0 \\ y_0 \end{bmatrix}$ is the center point of the circle, r is its radius in pixels and $\begin{bmatrix} x \\ y \end{bmatrix}$ is a point on the circumference, the two-way symmetry algorithm can be used to draw the circle. However, discontinuities may appear with this approach when (circle drawing)

A. $\left|\frac{y - y_0}{x - x_0}\right| \geq 1$ B. $\left|\frac{y - y_0}{x - x_0}\right| < 1$ C. $\left|\frac{y - y_0}{x - x_0}\right| < \frac{1}{2}$ D. $\left|\frac{y - y_0}{x - x_0}\right| \geq \frac{1}{2}$

3. In the Weiler-Atherton Algorithm, there are two types of polygons: a subject polygon that is to be clipped and a clip polygon. Polygons are clockwise-oriented. Consider an irregular subject polygon to be clipped by a rectangular clip polygon as shown in Fig. 1. What' the clipped polygon parts? (polygon clipping)
A. e1fg3h B. h3gf1e C. e1fg3ha D. h3gf1ea

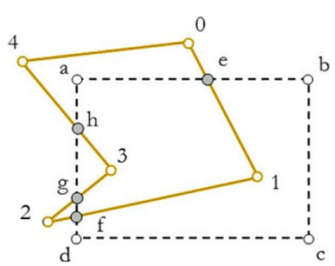

Fig. 1

4. What is the purpose of homogeneous coordinates? (geometric transformations)
A. to allow all coordinates to be represented homogeneously
B. to allow translation to be represented as a multiplication
C. to allow transformations to be combined by additions
D. to allow rotation and scaling to use the same matrices

5. Which of the following is not a property of perspective transformations? (projection)
A. parallel lines appear to converge in a vanishing point
B. object size reduces as distance from the centre of projection increases
C. foreshortening of lines depends on both orientation and distance
D. the shape of the object is preserved

6. Which of the following describes Phong shading? (shading)
A. interpolation of the shading across a facet
B. interpolation of the shading across a facet and a model for highlights
C. interpolation of the normal across a facet
D. interpolation of the normal across a facet and a model for highlights

7. The first transformation performed in the viewing pipeline is (viewing transformations)
A. Viewport transformation
B. Projection
C. Normalizing transformation
D. Viewing transformation

8. The intensity profile of a scene depends on many factors, but NOT (illumination)
A. Reflective and refractive properties of the surface geometry
B. Screen resolution
C. Position of viewpoint
D. Power and the number of light sources

9. This projection technique has the direction of projection perpendicular to the viewing plane, and the viewing direction is perpendicular to one of the principle faces. (projection)
A. Orthographic Parallel Projection
B. Axonometric Parallel Projection
C. Oblique Parallel Projection
D. Perspective Projection

10. The _____ algorithm is useful when the region is to be filled has no uniformly colored

Boundary. (filling)
A. Scan-line fill B. Flood fill C. Boundary fill D. Raster scan

Part II. Short questions. There are 4 questions, each worth 5 marks.

11. Explain the difference between the Bresenham algorithm and DDA for line drawing. (line drawing)

12. Why do we use triangles in computer graphics? (3D solid modeling)

13. The Painter's algorithm sorts polygons by the depth of their center of gravity, and draws the furthest polygon first. Sketch one example where this algorithm fails. (visibility)

14. Write out an implicit equation for the line spanning from $\begin{bmatrix} x_0 \\ y_0 \end{bmatrix}$ to $\begin{bmatrix} x_1 \\ y_1 \end{bmatrix}$. (line drawing)

Part III. Long questions.

15. For a given object, what does each of the following matrices do to the object? (geometric transformations) (8 marks)

I. $A = \begin{bmatrix} 0.707 & 0 & 0.707 & 0 \\ 0 & 1 & 0 & 0 \\ -0.707 & 0 & 0.707 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

II. $B = \begin{bmatrix} 1 & 0 & 0 & 3 \\ 0 & 1 & 0 & -1 \\ 0 & 0 & 1 & 2 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

III. C=AB
IV. $D=BAB^{-1}$

16. Show that in order to rotate about $\begin{bmatrix} t_x \\ t_y \end{bmatrix}$ through an angle θ, a matrix M is required where

$$M = \begin{bmatrix} \cos(\theta) & -\sin(\theta) & -t_x\cos(\theta) + t_y\sin(\theta) + t_x \\ \sin(\theta) & \cos(\theta) & -t_x\sin(\theta) - t_y\cos(\theta) + t_y \\ 0 & 0 & 1 \end{bmatrix}$$ (geometric transformations) (6 marks)

17. Derive the formula for the midpoint line drawing algorithm. (line drawing) (6 marks)

18. Write pseudo-code implementing a Cohen-Sutherland Algorithm for line clipping. (line clipping) (8 marks)

19. Suppose that a clip window is indicated by its lower left and upper right corners $\begin{bmatrix} 100 \\ 50 \end{bmatrix}$ and $\begin{bmatrix} 300 \\ 200 \end{bmatrix}$. Given the following three lines:

1. A line extending from a=$\begin{bmatrix} 171 \\ 88 \end{bmatrix}$ to b=$\begin{bmatrix} 233 \\ 171 \end{bmatrix}$.

2. A line extending from c=$\begin{bmatrix} 150 \\ 101 \end{bmatrix}$ to d=$\begin{bmatrix} 233 \\ 39 \end{bmatrix}$.

3. A line extending from e=$\begin{bmatrix} 52 \\ 15 \end{bmatrix}$ to f=$\begin{bmatrix} 98 \\ 45 \end{bmatrix}$.

Use the Cohen-Sutherland algorithm to determine what lines or portions of lines are preserved and kept. (line clipping) (6 marks)

20. The vertices of a triangle are placed at the positions A=$\begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$, B=$\begin{bmatrix} 5 \\ 0 \\ 0 \end{bmatrix}$ and C=$\begin{bmatrix} 0 \\ 5 \\ 0 \end{bmatrix}$. The colors assigned at these vertices are 100, 150, 200 respectively. Use scan line interpolation to get the shade value at the point P=$\begin{bmatrix} 2 \\ 2 \\ 0 \end{bmatrix}$. (shading) (6 marks)

Answer sheet.

考试课程	计算机图形学原理	考试日期	年 月 日	成 绩	
课程号		教师号		任课教师姓名	
考生姓名		学号（8 位）		年级	专业

Part I. Multiple choice questions.

1	2	3	4	5
6	7	8	9	10

Part II. Short questions.

Part III. Long questions.