

MARIA COLLEGE OF ENGINEERING & TECHNOLOGY,ATTOOR.

DEPARTMENT OF CSE&IT

TWO MARK QUESTIONS

UNIT I

2D PRIMITIVES

1. Define Computer graphics.

Computer graphics remains one of the most existing and rapidly growing computer fields. Computer graphics may be defined as a pictorial representation or graphical representation of objects in a computer.

2. Define refresh buffer/frame buffer.

The memory area where in picture definition is stored is called Refresh buffer. This memory area holds the set of intensity values for all the screen points. On a black and white system with one bit per pixel, the frame buffer is called a bitmap.

3. What is pixel?

Each screen point in a monitor is called a pixel/pel. It is also called picture element.

4. Define aspect ratio.

It is a property of video monitors. This number gives the ratio of vertical points to horizontal points necessary to produce equal-length lines in both directions on the screen.

5. What is Output Primitive?

Basic geometric structures that describe a scene are referred to as Output Primitives. Points and straight lines segments are the simplest geometric components of pictures. Additional output primitives that can be used to construct a picture include circles and other conic sections, quadric surfaces, spline curves and surfaces, polygon color areas, and character strings.

6. What is DDA?

The Digital Differential Analyzer is a scan-conversion line algorithm based on calculating either difference in y-coordinate (dy) or difference in x-coordinate. We sample the line at unit intervals in one coordinate and determine corresponding integer values nearest the line path for the other coordinate.

7. What are the disadvantages of DDA algorithm?

- Round-off error in successive additions of the floating-point increment can cause the calculated pixel positions to drift away from the true line path for long line segments.
- Rounding operations and floating-point arithmetic in procedure are still time-consuming.

8. What is attribute parameter?

Any parameter that affects the way a primitive is to be displayed is referred to as an attribute parameter.

9. What are the basic line attributes?

Basic attributes of a straight line segment are its type, its width, and its color.

10. What is meant by aliasing?

The distortion of information due to low frequency sampling (Under sampling) is called aliasing. We can improve the appearance of displayed raster lines by applying antialiasing methods that compensate for the under sampling process.

11. Define Translation.

A translation is applied to an object by repositioning it along a straight line path from one coordinate location to another. We translate a two-dimensional point by adding translation distances, t_x and t_y , to original coordinate position (x, y) to move the point to a new position (x', y') . $x' = x + t_x$, $y' = y + t_y$. The translation distance pair (t_x, t_y) is called a translation vector or shift vector.

12. Define Rotation.

A 2-D rotation is applied to an object by repositioning it along a circular path in the xy plane.

13. Define Scaling.

A scaling transformation alters the size of an object. This operation can be carried out for polygons by multiplying the coordinate values (x, y) of each vertex by scaling factors s_x and s_y to produce the transformed coordinates (x', y') . $x' = x \cdot s_x$, $y' = y \cdot s_y$.

14. Define Reflection.

A Reflection is a transformation that produces a mirror image of an object. The mirror image for a 2D reflection is generated relative to an axis of reflection by rotating the object 180 degree about the reflection axis.

15. Define Shear.

A transformation that distorts the shape of an object such that the transformed shape appears as if the object were composed of internal layers that had been caused to slide over each other is called a shear.

16. Define Window.

A world-coordinate area selected for display is called a window

17. Define view port.

An area on a display device to which a window is mapped is called a view port.

18. What is viewing transformation?

The mapping of a part of a world-coordinate scene to device coordinates is referred to as viewing transformation.

19. Define Clipping.

Any procedure that identifies those portions of a picture that are either inside or outside of a specified region of space is referred to as a

clipping algorithm or simply clipping. The region against which an object is clipped is called a clip window.

20. What are the types of Clipping?

- Point clipping
- Line clipping
- Area clipping
- Curve clipping
- Text clipping

21. What is the purpose of presentation graphics?

Presentation graphics is used to produce illustrations for reports or to generate 35-mm slides or transparencies for use with projectors.

Presentation graphics is commonly used to summarize financial, statical, mathematical, scientific, and economic data for research reports, managerial reports, consumer information bulletins, and other types of reports.

22. What is frame buffer?

Picture definition is stored in a memory area called frame buffer or refresh buffer.

16 MARK QUESTIONS

- 1.Explain DDA line drawing algorithm with Example.
- 2.Explain about midpoint ellipse drawing algorithm.
- 3.Explain about Bresenham's Line Drawing Algorithm.
- 4.Explain about clipping operations.
- 5.Explain about two dimensional geometric transformations.

UNIT II

3D CONCEPTS

1. Categorize the 3D representations?

Boundary representation (B-reps) and space-partitioning representations.

2. What Boundary representation?

It describes a 3D object as a set of surfaces that separate the object interior from the environment. e.g. polygon facets and spline patches.

3. What space-partitioning representation?

This is used to describe interior properties, by partitioning the spatial region containing an object in to a set of small, non-overlapping, contiguous solids. e.g. octree.

4. What is Transformation?

Transformation is the process of introducing changes in the shape size and orientation of the object using scaling rotation reflection shearing & translation etc.

5. What is projection?

The process of displaying 3D objects on a 2D display is called as Projection.

6. What are the types of projection?

- Perspective projection
- Parallel projection

7. What is parallel projection?

In a parallel projection, coordinate positions are transformed to the view plane along parallel lines.

8. What is Perspective projection?

For a perspective projection object positions are transformed to the view plane along lines that converge to a point called the projection reference point.

9. Write short notes on active and passive transformations?

In the **active transformation** the points x and $x|$ represent different coordinates of the same coordinate system. Here all the points are acted upon by the same transformation and hence the shape of the object is not distorted.

In a **passive transformation** the points x and $x|$ represent same points in the space but in a different coordinate system. Here the change in the coordinates is merely due to the change in the type of the user coordinate system.

10. What is scaling?

The scaling transformations changes the shape of an object and can be carried out by multiplying each vertex (x,y) by scaling factor S_x, S_y where S_x is the scaling factor of x and S_y is the scaling factor of y .

11. What is shearing?

The shearing transformation actually slants the object along the X direction or the Y direction as required. ie; this transformation slants the shape of an object along a required plane.

12. What is reflection?

The reflection is actually the transformation that produces a mirror image of an object. For this use some angles and lines of reflection.

13. Distinguish between window port & view port?

A portion of a picture that is to be displayed by a window is known as window port. The display area of the part selected or the form in which the selected part is viewed is known as view port.

14. Define clipping.

Clipping is the method of cutting a graphics display to neatly fit a predefined graphics region or the view port.

15. What is covering (exterior clipping)?

This is just opposite to clipping. This removes the lines coming inside the windows and displays the remaining. Covering is mainly used to make labels on the complex pictures.

16. What is the need of homogeneous coordinates?

To perform more than one transformation at a time, use homogeneous coordinates or matrixes. They reduce unwanted calculations intermediate steps saves time and memory and produce a sequence of transformations.

17. Distinguish between uniform scaling and differential scaling?

When the scaling factors s_x and s_y are assigned to the same value, a uniform scaling is produced that maintains relative object proportions. Unequal values for s_x and s_y result in a differential scaling that is often used in design application

18. What is fixed point scaling?

The location of a scaled object can be controlled by a position called the fixed point that is to remain unchanged after the scaling transformation.

19. List out the various Text clipping?

- All-or-none string clipping - if all of the string is inside a clip window, keep it otherwise discards.
- All-or-none character clipping – discard only those characters that are not completely inside the window. Any character that either overlaps or is outside a window boundary is clipped.
- Individual characters – if an individual character overlaps a clip window boundary, clip off the parts of the character that are outside the window.

20. What is the various representation schemes used in three dimensional objects?

- Boundary representation (B-res) – describe the 3 dimensional objects as a set of surfaces that separate the object interior from the environment.

- Space- partitioning representation – describe interior properties, by partitioning the spatial region containing an object into a set of small, no overlapping, contiguous solids.

16 MARK QUESTIONS

1. Write a short notes on B-spline curves.
2. What are Bezier curve? Discuss their properties.
3. Explain about 3D object representation.
4. Explain about 3D transformations.
5. Explain about visible surface identification.

UNIT-III

COLOR MODELS

1. What is color model?

A color model is a method for explaining the properties or behavior of color within some context.

2. List out the properties that are perceived in a light source.
 1. Hue
 2. Brightness(luminance)
 3. Purity(saturation)

3. How is the color expressed in XYZ color model?

Any color is expressed as

$$C = X\mathbf{X} + Y\mathbf{Y} + Z\mathbf{Z}$$

X, Y, and Z represent vectors in 3D

X, Y, and Z designate the amounts of the standard primaries.

4. What is RGB color model?

The RGB color model is an additive color model in which red, green and blue light is added together in various ways to reproduce a broad array of colors.

5. How is RGB model represented?

RGB model is represented by a unit cube. The color is expressed as an RGB triplet, each component of which can vary from 0 to 1.

6. What is YIQ color model?

YIQ is the color space used by the National Television System Committee color TV system. It was designed to separate chrominance from luminance. The Y, I, Q components are assumed to be in the [0,1] or [0,255] range.

7. How is RGB converted to CMY?

The conversion from RGB to CMY representation is done using the following matrix transformation.

$$[C \ M \ Y] = [1 \ 1 \ 1] - [R \ G \ B]$$

Where [1 1 1] represents white.

8. How is CMY converted to RGB?

The conversion from CMY to RGB representation is done using the following matrix transformation.

$$[R \ G \ B] = [1 \ 1 \ 1] - [C \ M \ Y]$$

Where [1 1 1] represents black.

9. What is HSV color model?

HSV stands for Hue, Saturation and Value.

Hue - The color we see (red, green, purple)

Saturation - How far is the color from gray

Value (Luminance) - How bright is the color.

10. What does Computer animation refer to?

Computer animation refers to any time sequence of visual changes in scene. It displays time variations in object size, color, transparency & surface texture.

11. What is Frame-by-Frame animation?

Frame-by-Frame animation is an animation in which each frame of the scene is separately generated and stored.

12. What does story board define?

The story board is an outline of the action. It defines the motion sequence as a set of basic events that are to take place.

13. What is Graphics editor?

The graphics editor allows designing and modifying object shapes, using spline surfaces, constructive solid geometry methods, or other representation schemes.

14. What is Morphing?

Transformation of object shapes from one form to another is called morphing.

15. What is OPENGL?

OpenGL stands for Open graphics library. OpenGL provides a set of commands to render a 3D scene i.e., the data is provided in an OpenGL usable form and OpenGL will show this data on the screen.

16. Write down the Skeleton of an event driven program using OpenGL?

```
Void main()  
{  
    Initialize things
```

```
Set the display mode
Create a screen window
Register the call back functions
Perhaps initialize other things
Enter the unending main loop
}
```

17. Give the format OpenGL vertex command?

The OpenGL vertex command contains

The prefix “gl” indicates a function from the OpenGL library.

The basic command root

The number of arguments being sent to the function

The type of argument.

18. What is the use of `glPointSize()`?

The `glPointSize()` is used to set the size of a point which takes one floating point argument.

Syntax

```
glPointSize(Glfloat size)
```

where

size specifies the diameter of rasterized points

the default is 1.0

19. What is the Modelview Matrix?

The modelview matrix is the CT. It combines the following 2 effects

- Modelling transformations on objects

- the transformation that orients and positions the camera in space.

20. What is the Viewport Matrix?

The viewport matrix maps the standard cube into a 3D viewport

Whose x and y values extend across the viewport and whose z component extends from 0 to 1.

16 mark Questions:

1. Explain about various color models?
2. What is OpenGL? Discuss about the event driven programming.
3. Explain about computer animation?
4. Explain about the basic graphics primitive of OpenGL?
5. Explain about drawing 3D objects & scenes?

UNIT IV

RENDERING

1. What is the shading model?

The shading model attempts to model how light that emanates from light sources would interact with objects in a scene. The shading model dictates how light is scattered or reflected from a surface

2. What is known as black body?

If all of the incident light is absorbed, the object appears black and is known as a blackbody.

3. State Lamber's Law?

The relationship between brightness and surface orientation is called lamber's law.

4. What are the three types of light contributions?

Diffuse

Specular

Ambient

5. What are the two types of smooth shading?

The 2 types of smooth shading are

- Gouraud shading
- Phong shading

6. What is called Phong shading?

Greater realism can be achieved, to highlights on shiny objects, by a better approximation of the normal vector to the face at each pixel. This type of shading is called Phong shading.

7. What is called texels?

Textures are formed bitmap representations of images. Such representation consists of an array, such as texture [c] [r], of color values called texels.

8. What is the use of glGetUniformLocation function?

The glGetUniformLocation function is used to retrieve the locations of some uniform variables that are defined in the shaders.

9. Mention the types of shader?

GL_VERTEX_SHADER

GL_FRAGMENT_SHADER

GL_DELETE_SHADER

GL_ATTACH_SHADER

10. Write down the function of texture(s,t)?

The function texture (s,t) accesses “samples” in the array, as in the code,

```
Color3 texture(float s, float t)
{
Return txtr[(int)(s*c)][(int)(t*R)];
}
```

11. What is the visible intensity?

The visible intensity I is set equal to the texture value at each spot.

$$I = \text{texture}(s,t)$$

12. What is the use of glTexCoord2f() function?

The function glTexCoord2f() is used to associate a point in texture space, $P_i=(s_i,t_i)$ with each vertex V_i of the face.

13. Write down the OpenGL command to define a quadrilateral face.

```
glBegin(GL_QUADS); //define a quadrilateral face
glTexCoord2f(0.0,0.0); glVertex3f(1.0,2.5,1.5);
glTexCoord2f(0.0,0.6); glVertex3f(1.0,3.7,1.5);
glTexCoord2f(0.8,0.6); glVertex3f(2.0,3.7,1.5);
glTexCoord2f(0.8,0.0); glVertex3f(2.0,2.5,1.5);
glEnd();
```

14. Give the basic idea of reflection Mapping.

The reflection mapping can significantly improve the realism of pictures especially animations. The basic idea is to see reflections in an object that suggest the “world” surrounding that object.

15. What is called a shadow buffer?

An auxiliary second depth buffer, called a shadow buffer, is employed for each light source. It contains depth picture for the scene from the point of view of the light source.

16. What does sliding mean?

Sliding means to move the camera along one of its own axes, (ie) in the u, v or n directions, without rotating it.

17. Write down the syntax for `glFramebufferRenderbufferEXT()`.

```
Void glFramebufferRenderbufferEXT(GLenum target,  
    GLenum attachmentPoint,  
    GLenum renderbufferTarget,  
    GLuint renderbufferId);
```

18. What is the function of `glCheckFramebufferStatusEXT()`?

The `glCheckFramebufferStatusEXT()` validates all its attached images and framebuffer parameters on the currently bound FBO. And, this function cannot be called within `glBegin()/glEnd()` pair.

19. Write down the syntax for `glGetRenderbufferParameterivEXT()`.

```
Void glGetRenderbufferParameterivEXT(GLenum target, GLenum  
    param, GLint* value);
```

20. List out some of the rules of FBO completeness.

- The width and height of framebuffer-attachable image must be not zero
- FBO must have at least one image attached

- All images attached a FBO must have the same width and height
- All images attached the color attachment points must have the same internal format.

16 mark Questions:

1. Explain about shading models?
2. Explain in detail about Flat and Smooth shading?
3. Explain in detail about adding texture to faces?
4. Explain in detail about adding shadows of objects?
5. Discuss about the process of creating shaded objects?

UNIT V

FRACTALS

1. Define Fractal

A fractal is an image or a geometric object with self-similar properties produced by recursive or iterative algorithmic means .

2. List out some properties of fractal.

- Self similar
- Formation by iteration
- Fractional dimension
- Form is extremely irregular or fragmented

3. What are three types of self-similarity found in fractals?

- Exactly self-similar
- Quasi-self-similarity

- Statistically self-similar

4. Give some examples of fractals.

- Clouds
- Grass
- Fore
- Modeling mountains(terrain)
- Coastline
- Branches of a tree
- Surface of a sponge
- Cracks in the pavement

5. What is Koch Curve?

The Koch curve is a curve that is generated by a simple geometric procedure which can be iterated an infinite number of times by dividing a straight line segment into three equal parts and substituting the intermediate part with two segment of the same length.

6. Give the general procedure to construct Koch curve.

- To form K_{n+1} from K_n :
 - Subdivide each segment of K_n into three equal parts and replace the middle part with a bump in the shape of an equivalent triangle.
 - Total length of K_i is $(4/3)^i$ which increases as i increases.

7. What is known as L-Systems?

L-systems(also known as Lindenmayer Systems or parallel string-rewrite systems) is a simple approach to generate a large number of complex curves by refining the line segments based on a simple set of rules.

8. What are the instructions to be followed in L-systems?

An L-system works by giving the turtle a string sequence where each symbol in the sequence gives turtle instructions.

- 'F' → go forward 1 step
- '+' → turn right by x degrees
- '-' → turn left by x degrees

Where x is set and predetermined.

9. What is String Production Rules?

String Production Rules is a rule used to generate a simple String in to the longer one that will generate richer curve.

10. What is Iterated Function System(IFS)?

Iterated function systems or IFSs are a method of constructing fractals in which each string is repeatedly fed back into the same function to produce the next higher order object; the resulting constructions are always self-similar.

11. Give the rules for Dragon Curves?

The rules that used X and Y for dragon curves

$F \rightarrow F$

$X \rightarrow X+YF+$

$Y \rightarrow -FX-Y$

Atom=FX

- F means “draw forward”
- - means “turn left 90⁰”, and
- + means “turn right 90⁰”.

12. Give the parameter to represent each curves based on String production

The five key ingredients for each curve

- Atom
- F-string
- X-string
- Y-string
- Angle in degree

13. What is space-filling curve?

A space-filling curves in the 2D plane are commonly called Peano curves.

14. What is called Ray Tracing?

Ray tracing, also called as ray casting, is a technique for generating an image by tracing the path of light through pixels in an image plane and simulating the effects of its encounters with virtual objects.

15. What is the state of a turtle?

A turtle has a position and points in some direction, so its state consists of the values of the current position (CP) and current direction (CD)

State of the turtle={CP,CD}

16. What is the functionality of hit() methods?

The hit() methods performs the following functions

- The ray is first transformed into the generic coordinates of the object
- The various intersections with the generic object are computed

17. What is known as Surface texture?

Surface texture, also known as surface finish, is the characteristics of a surface in which computer-generated images is made more lively and realistic by painting textures on various surfaces.

18. What is total internal reflection?

The internal reflection is an optical phenomenon that happens when a ray of light strikes a medium boundary at an angle larger than a particular critical angle with respect to the normal to the surface

19. What is Constructive solid geometry?

Constructive solid geometry (CSG) is a technique used in solid modeling. Constructive solid geometry allows a modeler to create a complex surface or object by using Boolean operators to combine objects.

20. What is CSG Objects?

CSG objects (also called as compound or Boolean objects) is an object is constructed by combining the primitives by means of allowable operations, which are typically Boolean operation on sets,

- Union
- Intersection
- Difference

16 mark Questions:

1. Define Koch curve? How do you construct the Koch curve?
2. Explain about Mandelbrot sets?
3. Explain about Julia sets?
4. Explain about Intersecting rays with other primitives?
5. Explain about Boolean operation on objects?

