Computer graphics

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. What is meant by scan code?

When a key is pressed on the keyboard, the keyboard controller places a code carry to the key pressed into a part of the memory called as the keyboard buffer. This code is called as the scan code.

3. What is meant by refreshing of the screen?

Some method is needed for maintaining the picture on the screen. Refreshing of screen is done by keeping the phosphorus glowing to redraw the picture repeatedly. (i.e.)By quickly directing the electronic beam back to the same points.

4. Define Random scan/Raster scan displays?

Random scan is a method in which the display is made by the electronic beam which is directed only to the points or part of the screen where the picture is to be drawn.

The Raster scan system is a scanning technique in which the electrons sweep from top to bottom and from left to right. The intensity is turned on or off to light and unlight the pixel.

5. List out the merits and demerits of Penetration techniques.

The merits and demerits of the Penetration techniques are as follows

- It is an inexpensive technique
- It has only four colors
- The quality of the picture is not good when it is compared to other techniques
- It can display color scans in monitors
- Poor limitation etc.

6. List out the merits and demerits of DVST?

The merits and demerits of direct view storage tubes [DVST] are as follows:

- It has a flat screen
- Refreshing of screen is not required
- Selective or part erasing of screen is not possible
- It has poor contrast
- Performance is inferior to the refresh CRT.

7. What do you mean by emissive and non-emissive displays?

The emissive display converts electrical energy into light energy. The plasma panels, thin film electro-luminescent displays are the examples.

The Non emissive are optical effects to convert the sunlight or light from any other source to graphic form. Liquid crystal display is an example.

8. What is persistence?

The time it takes the emitted light from the screen to decay one tenth of its original intensity is called as persistence.

9. What is resolution?

The maximum number of points that can be displayed without an overlap on a CRT is called as resolution.

10. List out the merits and demerits of Plasma panel display:

Merits

- Refreshing is not required
- Produce a very steady image free of Flicker
- Less bulky than a CRT.

Demerits

- Poor resolution of up to 60 d.p.i
- It requires complex addressing and wiring
- It is costlier than CRT.

11. What is Aspect ratio?

The ratio of vertical points to the horizontal points necessary to produce length of lines in both directions of the screen is called the Aspect ratio. Usually the aspect ratio is ¾.

12. What is meant by Addressability?

The Addressability is the number of individual dots per inch (d.p.i) that can be created. If the address of the current dot is (x, y) then the next dot will be (x+y), (x+y+1) etc.

13. What is a dot size?

Dot size may be defined as the diameter of a single dot on the devices output. Dot size is also called as the Spot size.

14. What is interdot distance?

Interdot distance is the reciprocal of addressability. If the addressability is large, the interdot distance will be less. The interdot distance should be less to get smooth shapes.

15. What is the difference between impact and non-impact printers?

Impact printer press formed character faces against an inked ribbon on to the paper. A line printer and dot-matrix printer are examples.

Non-impact printer and plotters use Laser techniques, inkjet sprays, Xerographic process, electrostatic methods and electro thermal methods to get images onto the papers.

Examples are: Inkjet/Laser printers.

16. What are the features of Inkjet printers?

- They can print 2 to 4 pages/minutes.
- Resolution is about 360d.p.i. Therefore better print quality is achieved.
- The operating cost is very low. The only part that requires replacement is ink cartridge.
- 4 colors cyan, yellow, magenta, black are available.

17. Define pixel.

Pixel is shortened forms of picture element. Each screen point is referred to as pixel or pel.

18. What is frame buffer?

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

19. What are the advantages of laser printer?

- High speed, precision and economy.
- Cheap to maintain.
- Quality printers.
- Lasts for longer time.
- Toner power is very cheap.

20. What are the advantages of electrostatic plotters?

- They are faster than pen plotters and very high quality printers.
- Recent electrostatic plotters include a scan-conversion capability.
- Color electrostatic plotters are available. They make multiple passes over the paper to plot color pictures.

21. What is bitmap and what is pixmap?

The frame buffer used in the black and white system is known as bitmap which take one bit per pixel. For systems with multiple bits per pixel, the frame buffer is often referred to as a pixmap.

22. What is a Vector display or stroke writing or calligraphic display?

Random scan monitors draw a picture one line at a time and for this reason are also referred as vector displays.

23. Where the video controller is used?

A special purpose processor, which is used to control the operation of the display device, is known as video controller or display controller.

24. What do you mean by scan conversion?

A major task of the display processor is digitizing a picture definition given in an application program into a set of pixel-intensity values for storage in the frame buffer. This digitization process is called scan conversion.

25. What is an output primitive?

Graphics programming packages provide function to describe a scene in terms of these basic geometric structures, referred to as output primitives.

26. What do you mean by 'jaggies'?

Line with stair step appearance is known as jaggies.

27. What is point in the computer graphics system?

The point is a most basic graphical element & is completely defined by a pair of user coordinates (x , y).

28. Write short notes on lines?

A line is of infinite extent can be defined by an angle of slope q and one point on the line P=P(x,y). This can also be defined as Y=mx+C where C is the Y- intercept.

29. Define Circle.

Circle is defined by its center xc, yc and its radius in user coordinate units. The equation of the circle is $(x-x_c) + (y-y_c) = r^2$.

30. Define polygon.

A polygon is any closed continues sequence of line segments ie, a polyline whose last node point is same as that of its first node point. The line segments form the sides of the polygon and their intersecting points form the vertices of the polygon.

31. Distinguish between convex and concave polygons.

If the line joining any two points in the polygon lies completely inside the polygon then, they are known as convex polygons. If the line joining any two points in the polygon lies outside the polygon then, they are known as concave polygons.

32. What is seed fill?

One way to fill a polygon is to start from a given point (seed) known to be inside the polygon and highlight outward from this point i.e neighboring pixels until encounter the boundary pixels, this approach is called seed fill.

33. What is scan line algorithm?

One way to fill the polygon is to apply the inside test. i.e to check whether the pixel is inside the polygon or outside the polygon and then highlight the pixel which lie inside the polygon. This approach is known as scan-line algorithm.

34. Define coherence properties

A coherence property of a scene is apart of a scene by which relate one part of the scene with the other parts of the scene.

35. What is an active edge list in the scan line algorithm?

The active edge list for a scan line contains all edges crossed by that scan line.

36. What is cell array?

The cell array is a primitive that allows users to display an arbitrary shape defined as a two dimensional grid pattern.

37. What is type face?

Letters, numbers and other characters can be displayed in a variety of sizes and styles. The overall design style for a set of characters is called a type face.

38. What do you mean by font?

The term font referred to a set of cast metal character forms in a particular size and format, such as 10-point courier italic.

39. What is a bitmapped font?

A simple method for representing the character shapes in a particular typeface is to use rectangular grid patterns. The set of characters are then referred to as a bitmap font.

40. What is an outline font?

A flexible scheme is to describe character shapes using straight-line and curve sections. In this case, the set of character is called an out line font.

41. What is an attribute parameter?

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

42. What are the various attributes of a line?

The line type, width and color are the attributes of the line. The line type include solid line, dashed lines, and dotted lines.

43. What is pixel mask?

Pixel mask is a string containing the digits 1 and 0 to indicate which positions to plot along the line path. The mask 1111000, could be used to display a dashed line with a dash length of 4 and inter dot spacing of three.

44. What is a Line cap?

Line caps can be used to adjust the shape of the line ends to give a better appearance. There are three types of line caps. Butt cap which has a square end, round cap which has a semi circle end, projecting square cap which has one half of the line width beyond the specified end points.

45. List out the methods used for smoothly joining two line segments?

Mitter join- by extending the outer boundaries of each of the two lines until they meet.
Round join – by capping the connection between the two segments with a circular boundary whose diameter is equal to the line width.
Bevel join – by displaying the line segments with butt caps and filling in the triangular gap where the segment meet.

46. What is Color Look up table?

In color displays, 24 bits per pixel are commonly used, where 8 bits represent 256 level for each color. It is necessary to read 24- bit for each pixel from frame buffer. This is very time consuming. To avoid this video controller uses look up table to store many entries to pixel values in RGB format. This look up table is commonly known as colour table.

47. What is tiling patterns?

The process of filling an area with rectangular pattern is called tiling and rectangular fill patterns are sometimes referred to as tiling patterns.

48. What is soft fill?

Soft fill is a filling method in which fill color is combined with the background colors

49. What is kerned character?

The characters which extend beyond the character body limits is known as kerned character.
Example f and j.

50. What is character up vector?

The orientation for a displayed character string is set according to the direction of the character up vector.

51. Define bundled attributes

Individual attribute commands provide a simple and direct method for specifying attributes when a single output device is used. When several kinds of output device are available at a graphics installation, it is convenient to set up a table for each output device that lists set of attribute values that are to be used on that device to display each primitive type. Attribute specified in this manner is known as bundled attribute.

52. What is aliasing?

In the line drawing algorithms, all rasterzed locations do not match with the true line and have to represent a straight line. This problem is severe in low resolution screens. In such screens line appears like a stair-step. This effect is known as aliasing.

53. What is antialiasing?

The process of adjusting intensities of the pixels along the line to minimize the effect of aliasing is called antialiasing.

54. What is pixel phasing?

Pixel phasing is an antialiasing technique, stair steps are smoothed out by moving the electron beam to more nearly approximate positions specified by the object geometry.

55. 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.

56. 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.

57. What is translation?

Translation is the process of changing the position of an object in a straight-line path from one coordinate location to another. Every point (x , y) in the object must under go a displacement to (x|,y|). the transformation is:

$$x| = x + tx$$
$$y| = y+ty$$

58. 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 Sx,Sy where Sx is the scaling factor of x and Sy is the scaling factor of y.

59. 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.

60. 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.

61. 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.

62. Define clipping.

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

63. 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.

64. 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.

65. Distinguish between uniform scaling and differential scaling?

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

66. 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.

67. 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.

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

69. What is Polygon mesh?

Polygon mesh is a method to represent the polygon, when the object surfaces are tiled, it is more convenient to specify the surface facets with a mesh function. The various meshes are

Triangle strip – (n-2) connected triangles

Quadrilateral mesh – generates (n-1)(m-1) Quadrilateral

70. What is surface patch?

A single surface element can be defined as the surface traced out as two parameters (u, v) take all possible values between 0 and 1 in a two-parameter representation. Such a single surface element is known as a surface patch.

71. What are the advantages of rendering polygons by scan line method?

i. The max and min values of the scan were easily found.
ii. The intersection of scan lines with edges is easily calculated by a simple incremental method.
iii. The depth of the polygon at each pixel is easily calculated by an incremental method.

72. What are the advantages of rendering by patch splitting?

i. It is fast- especially on workstations with a hardware polygon-rendering pipeline.
ii. Its speed can be varied by altering the depth of sub-division.

73. Define B-Spline curve

A B-Spline curve is a set of piecewise (usually cubic) polynomial segments that pass close to a set of control points. However the curve does not pass through these control points, it only passes close to them.

74. What is a spline?

To produce a smooth curve through a designed set of points, a flexible strip called spline is used. Such a spline curve can be mathematically described with a piecewise cubic polynomial function whose first and second derivatives are continuous across various curve section.

75. What is the use of control points?

Spline curve can be specified by giving a set of coordinate positions called control points, which indicates the general shape of the curve, can specify spline curve.

76. What are the different ways of specifying spline curve?

- Using a set of boundary conditions that are imposed on the spline.
- Using the state matrix that characteristics the spline
- Using a set of blending functions that calculate the positions along the curve path by specifying combination of geometric constraints on the curve.

77. What are the important properties of Bezier Curve?

- It needs only four control points
- It always passes through the first and last control points
- The curve lies entirely within the convex half formed by four control points.

78. Differentiate between interpolation spline and approximation spline.

When the spline curve passes through all the control points then it is called interpolate. When the curve is not passing through all the control points then that curve is called approximation spline.

79. What do you mean by parabolic splines?

For parabolic splines a parabola is fitted through the first three points p1,p2,p3 of the data array of kot points. Then a second parabolic arc is found to fit the sequence of points p2, p3, p4. This continues in this way until a parabolic arc is found to fit through points pn-2, pn-1 and pn. The final plotted curve is a meshing together of all these parabolic arcs.

80. What is cubic spline?

Cubic splines are a straight forward extension of the concepts underlying parabolic spline. The total curve in this case is a sequence of arcs of cubic rather than parabolic curves

81. Define Octrees

Each cubic satisfies :$ax^3 + bx^2 + cx + d$

Hierarchical tree structures called octrees, are used to represent solid objects in some graphics systems. Medical imaging and other applications that require displays of object cross sections commonly use octree representation.

82. Define Projection

The process of displaying 3D into a 2D display unit is known as projection. The projection transforms 3D objects into a 2D projection plane.

83. What are the steps involved in 3D transformation?

- Modeling Transformation
- Viewing Transformation
- Projection Transformation
- Workstation Transformation

84. What do you mean by view plane?

A view plane is nothing but the film plane in camera which is positioned and oriented for a particular shot of the scene.

85. What is view-plane normal vector?

This normal vector is the direction perpendicular to the view plane and it is called as [DXN DYN DZN]

86. What is view distance?

The view plane normal vector is a directed line segment from the view plane to the view reference point. The length of this directed line segment is referred to as view distance

87. Define projection

The process of converting the description of objects from world coordinates to viewing coordinates is known as projection

88. What you mean by parallel projection?

Parallel projection is one in which z coordinates is discarded and parallel lines from each vertex on the object are extended until they intersect the view plane.

89. What do you mean by Perspective projection?

Perspective projection is one in which the lines of projection are not parallel. Instead, they all converge at a single point called the center of projection.

90. **What is Projection reference point?**

In Perspective projection, the lines of projection are not parallel. Instead, they all converge at a single point called Projection reference point.

91. What is the use of Projection reference point?

In Perspective projection, the object positions are transformed to the view plane along these converged projection line and the projected view of an object is determined by calculating the intersection of the converged projection lines with the view plane.

92. What are the different types of parallel projections?

The parallel projections are basically categorized into two types, depending on the relation between the direction of projection and the normal to the view plane. They are orthographic parallel projection and oblique projection.

93. What is orthographic parallel projection?

When the direction of the projection is normal (perpendicular) to the view plane then the projection is known as orthographic parallel projection

94. What is orthographic oblique projection?

When the direction of the projection is not normal (not perpendicular) to the view plane then the projection is known as oblique projection.

95. What is an axonometric orthographic projection?

The orthographic projection can display more than one face of an object. Such an orthographic projection is called axonometric orthographic projection.

96. What is vanishing point?

The perspective projections of any set of parallel lines that are not parallel to the projection plane converge to appoint known as vanishing point.

97. What do you mean by principle vanishing point?

The vanishing point of any set of lines that are parallel to one of the three principle axes of an object is referred to as a principle vanishing point or axis vanishing point.

98. What is view reference point?

The view reference point is the center of the viewing coordinate system. It is often chosen to be close to or on the surface of the some object in the scene.