Questions on Unit-1

1) Define the following:

a) Pixel	b) Resolution	c) Bit Plane
d) Raster	e) Depth of the frame Buffer	f) Refresh Rate
g) Frame Buffer	h) Rasterization	i) Aspect Ratio

2) Discuss the applications of computer graphics.
3) With the help of a diagram, describe the open GL interface.
4) Describe the working of CRT with a neat diagram.
5) Differentiate Raster Scan and Random Scan Displays.
6) Differentiate DDA and Bresenham's line drawing algorithm.
7) Explain DDA Line Algorithm with an Example.
8) Define scan conversion. Write an algorithm of DDA line drawing.
9) Write an algorithm of DDA Line drawing. Consider a line AB with A(0,0) and B(8,4). Apply a simple DDA to calculate the pixels of this line.
10) Consider a line from (0,0) to B(6,6). Using simple DDA to calculate the points of this line.
11) Consider a line from (0,0) to (5,5). Using simple DDA to calculate the points of this line.
12) Use DDA to draw pixels of the line AB with A(1,1) and B(5,3).
13) Use Bresenham's line drawing algorithm to draw pixels of the line XY(5,5) and Y (13,9)
14) Use Bresenham's line drawing algorithm to draw pixels of the line XY(0,0) and Y (8,4)
15) Write the applications of line drawing algorithm.
16) Explain the architecture of raster scan system with suitable diagrams.
17) Rasterize the line segment from pixel coordinate (1, 1) to (8,5) using Bresenham's line drawing algorithm.
18) Scan convert the line segment with end points (0,0) and (10,5) using DDA line drawing algorithm. Find out and discuss the advantages and disadvantages of this method.
19) Describe the working of a beam penetration and shadow mask CRT.
20) Derive the expression for decision parameter used in Bresenham's line drawing algorithm.
21) Explain Random scan and Raster scan display system.
22) Explain Bresenham's Line Drawing Algorithm to draw line between 2 end points.
23) For 10×10 frame buffer, interpret the Bresenham's algorithm to find which pixels are turned on for the line segment (1, 2) and (7, 6).
24) Explain OpenGL Line Primitive functions with examples.
25) What are attribute functions? Explain OpenGL Point-Attribute Functions.
26) Explain OpenGL Line-Attribute Functions.
27) Write explanatory notes on: i) RGB color model; ii) indexed color model.
28) Explain the additive and subtractive colors, indexed color and RGB color concept.

Questions on Unit-2

1. Explain rotation in 2D.Show that two successive rotations are additive.
2. Briefly explain the 3 basic transformations in 3D. Obtain the homogeneous coordinate matrix for the same.
3. Explain rotation, translation and scaling with respect to 2D.
4. Consider on object ABC with co-ordinates A (1,1) ,B (10,1) ,C (5,5) Rotate the object by 90 Degree in counter clockwise direction and give co-ordinates of transformed object.
5. Apply following transformations on polygon A(10,10) ,B(10,40),C(30,10), D(20,50)and E(30,40).
    a. Translation 10, 20 units along X&Y directions.
    b. Rotate 45 degrees about the origin.
    c. Scale with scaling factor(2,2)
6. Explain window, view port and window - to - view port transformation.
7. Obtain the matrix representation for rotation of a object about an arbitrary axis.
8. Design a transformation matrix for window to viewport transformation.
9. With the help of a suitable diagram explain basic 3D Geometric transformation techniques and give the transformation matrix.
10. Design transformation matrix to rotate an 3D object about an axis that is parallel to one of the co-ordinate axis.
11. What is concatination of Transformations? Explain rotation about a fixed point.
12. All proofs
13. Examples
14. Homogeneous Transformations.
15. Explain reflection with transformation matrix.
16. Define and represent the following 2-D transformations in homogenous coordinate system.
    a. Translation
    b. Rotation
    c. Scaling
    d. Reflection
17. Explain the basic transformations in 3D and represent them in matrix form.
18. What is the need of homogeneous coordinates? Give 2-dimension homogeneous coordinate matrix for translation, rotation and scaling.
19. Obtain a matrix representation for rotation of a object about a specified pivot point in 2-dimension.
20. Explain OpenGL geometric transformation functions.
21. Explain translation, rotation and scaling of 2D transformation with suitable diagrams, equations and matrix.
22. Explain any two of the 3D geometrical transformation.

Questions on Unit-3

1. Explain the 6 logical classifications of input devices.7M
2. Explain the 7 interactive Picture Construction Techniques.10M
3. Explain any three programming event driven input with suitable examples. Explain the various input modes with neat diagram.10M
4. Discuss Logical Device and Hierarchical Menus.10M
5. Explain Request, Sample and Event mode with suitable diagram. 6M
6. Define double buffering. Explain how double buffering is implemented in OpenGL.(06 Marks)
7. Explain Menu creation in OpenGL. Write an interactive OpenGL program to display a square when the left button is pressed and to exit the program if right button is pressed.(08 Marks)
8. List and explain the various classes of logical input devices that are supported by OpenGL. With suitable diagrams, explain various input modes.(10 Marks)
9. Explain how keyboard events are recognized by GLUT. Give suitable example.(10)
10. Explain how window events are recognized by GLUT. Give suitable example.(10)
11. Explain how mouse events are recognized by GLUT. Give suitable example.(10)
12. How pop-up menus are created using GLUT? Illustrate with an example.(10 Marks)
13. What are the features of a good interactive program? Explain.(10 Marks)
14. Illustrate with an example the steps in construction of Animation Sequences (8M)
15. Explain the key factors to be considered when designing a user interface to ensure optimal user experience and accessibility? (10M)
16. What is computer animation? Explain the various stages in the development of animation sequences. (10M)
17. What is meant by measure and trigger of a device? Explain with the neat diagram, the various input mode models.(10M)
18. Explain the following: (i) Request Mode (ii)Sample Mode (iii) Event Mode (10M)
19. Differentiate event mode with request mode.(04M)
20. Write an OpenGL program to display square when a left button is pressed and to exit the program if right button is pressed. (10M)
21. Using OpenGL functions, explain the structure of hierarchical menus. (06M)
22. List out the characteristics of good interactive program. Explain in detail. (10M)
23. What is double buffering? How OpenGL implements double buffering? (5M)

Questions on Unit-4

1. Write a Program to read a digital image. Split and display image into 4 quadrants, up, down, right and left.
2. Write a program to show rotation, scaling, and translation on an image.
3. In detail explain the fundamental steps involved in digital image processing systems.
4. Explain in detail the classification of images.
5. Illustrate the relationship between image processing and other related fields.
6. Given a grey-scale image of size 5 inches by 6 inches scanned at the rate of 300 dpi, answer the following:
   (a) How many bits are required to represent the image?
   (b) How much time is required to transmit the image if the modem is 28 kbps?
   (c) Repeat (a) and (b) if it were a binary image.
7. Explain Digital image representation. A picture of physical size 2.5 inches by 2 inches is scanned at 150 dpi. How many pixels would be there in the image?
8. Explain Distance measure. Compute the Euclidean Distance (D1), City-block Distance (D2) and Chessboard distance (D3) for points p and q, where p and q be (5, 2) and (1, 5) respectively. Give answer in the form (D1, D2, D3).
9. Describe the fundamental steps in image processing?
10. Describe the basic relationship between the pixels
    a. Neighbours of a pixel
    b. Adjacency, Connectivity, Regions and Boundaries
    c. Distance measures
11. All solved problems in notes.
12. Summarize the Arithmetic operations on digital images with relevant expressions.
13. Summarize the Logical operations on digital images with relevant expressions.
14. Explain 2D Geometric transformation with equations and homogeneous matrix.
15. Consider two pixels x and y whose coordinates are (0, 0) and (6, 3) .Compute De, D4, D8 distance between x and y
16. Consider the following two images. Perform the arithmetic operations: addition, multiplication, division. Assume that all the operations are uint8.

$$f_1 = \begin{pmatrix} 10 & 40 & 30 \\ 40 & 100 & 90 \\ 90 & 80 & 70 \end{pmatrix} \quad f_2 = \begin{pmatrix} 40 & 140 & 90 \\ 140 & 100 & 90 \\ 90 & 80 & 190 \end{pmatrix}$$

17. Consider the images f1 and f2 in above question. What is the result of image subtraction and image absolute difference? Is there any difference between them?

18. Consider the following binary image. Show the results of the dilation and erosion operations.

$$F = \begin{array}{c|ccc} & 0 & 1 & 2 \\ \hline 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 1 \\ 2 & 0 & 1 & 1 \end{array}$$

19. Consider the following two images. The addition and subtraction of images are given by f1+f2 and f1−f2. Assume both the images are of the 8-bit integer type.

$$f1 = \begin{matrix} 100 & 100 & 100 \\ 50 & 50 & 50 \\ 200 & 150 & 150 \end{matrix} \quad \text{and} \quad f2 = \begin{matrix} 50 & 50 & 25 \\ 40 & 40 & 50 \\ 50 & 50 & 75 \end{matrix}$$

20. Consider the following two images. Perform the logical operations AND, OR, NOT and difference.

$$f_1 = \begin{pmatrix} 1 & 0 & 0 \\ 1 & 1 & 1 \\ 0 & 0 & 1 \end{pmatrix} \quad f_2 = \begin{pmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{pmatrix}$$

Questions on Unit-5

1. Explain the various stages involved in edge detection process. **10M CO5 L2**

2. How edge detection is performed in digital images using Roberts operator. (8M) **CO5 L3**
3. How edge detection is performed in digital images using Sobel operator. (8M) **CO5 L3**
4. How edge detection is performed in digital images using Prewitt operator. (8M) **CO5 L3**
5. How edge detection is performed in digital images using First-order Edge Detection operator. (8M) **CO5 L3**
6. Describe about the canny edge detector with necessary equation and also write its algorithm. 12M **CO5 L2**
7. Describe about the Marr-Hilldreth edge detector used in image segmentation with necessary equations. 10M **CO5 L3**

8. Define image segmentation formally and describe the characteristics of the segmentation process. 10M **CO5 L2**
9. Explain the classification of various image segmentation algorithms and delineate their distinct types. 10M **CO5 L2**
10. Explain the three fundamental types of gray-level discontinuities in digital images. 12M **CO5 L2**
11. Describe the concept of an "edge" in image processing, and how does it contribute to the understanding and analysis of digital images? Classify the types of edges in the digital image. **10M CO5 L3**

12. Write a python program to read an image and extract and display low-level features such as edges, textures using filtering techniques. 8M **CO5 L4**
13. Write a python program to contour an image. 8M **CO5 L4**
14. Explain the different types of edge detectors. **8M CO5 L4**