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ASSIGNMENT- 1

Q1. Define Computer Graphics

Ans1. Computer graphics is one of the most effective and commonly used way to communicate the processed information to the user. It displays the information in the form of graphics objects such as pictures, charts, graphs and diagrams instead of simple text. Therefore we can say that computer graphics makes it possible to express data in pictorial form. The picture or graphics objects may be an engineering drawing business graphs architectural structures, a single frame from an animated movie or a machine parts illustrated for a service manual.

Q2. 10 Application Area of computer graphics

Ans2. 1) Architectural Design :- It involves the creation of 3D representations of buildings, landscapes, or other architectural designs. It shows how the design will look in real life.

2) Education :- 3D models of complex objects can be created thus enabling educators to create more interactive sessions and engage students CG have changed the way to teach and learn

3) Scientific Visualization :- CG have made it possible to gain insights into molecules structure

4) Entertainment :- CG are now commonly used in making motion pictures, music videos and television shows

5) Video Games :- Many video games use 3D models to create a more realistic environment for players. Most of the popular games have been created using computer graphics

6) Cryptography :- CG is used to represent geo maps, weather maps, oceanographic charts etc

7) Use in Biology:- Molecular biologist can display a picture of molecules and gain insight into their structure with the help of computer graphics

8) Flight Simulator:- It helps in giving training to the pilots of airplanes. These pilots spend much of their training not in real aircraft but on the ground at the controls of flight Simulator.

9) Computer Art:- CG are also used in the field of commercial arts. It is used to generate television and advertising commercial.

10) Printing Technology:- CG is used for printing technology and textile design.

Q3. Write a short note on Color Models

Ans3 Color model is a 3D color coordinate system to produce all range of color through the primary color set. A color model is a hierarchical system in which we can create every color by using RGB and CMYK models.

Type of color Model

- Additive (RGB)
- Subtractive (CMYK)

Additive Color Model: It is also named as RGB model RGB stands for Red, Green, Blue. The additive color model uses a mixture of light to display colors. The perceived color depends on the transmission of light. It is used in digital media.

eg Computer Monitor, Television etc

Subtractive Color Model: It is also named as CMYK model. CMYK stands for Cyan, Magenta, Yellow and Black. The subtractive model uses a reflection of light to display the colors. The perceived color depends on the reflection of light. It uses printing inks.

eg paint, pigments, and color filter etc

Q4. Explain the working of LED display

Ans4. LED displays are commonly used in CG to display images and video. An LED is made up of many small LED lights that emit light when a current is applied to them. The LEDs are arranged in a grid pattern, with each LED representing a pixel on the display.

In CG the video signal is converted into an electrical signal that is sent to the LED display. The signal is then converted into a voltage that is applied to each LED. The voltage causes the LED to emit light and the brightness of the light is determined by the amount of voltage applied

The LEDs are arranged in rows and columns and each row and column has a control circuit that determines when the LED should be on or off. The control of circuits are controlled by a microcontroller or other electronic device which sends signals to the control circuits to turn on and off specific LEDs.

∴ the working of an LED display in computer graphics involves converting the video signal into an electrical signal, applying voltage to each LED, and controlling the LEDs using a microcontroller or other electronic device to display images and video on the display.

Q5. Prove that matrix multiplication is non commutative

Ans5. $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ $B = \begin{bmatrix} 5 & 6 \\ 7 & 8 \end{bmatrix}$

$$AB = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}\begin{bmatrix} 5 & 6 \\ 7 & 8 \end{bmatrix} \qquad BA = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}\begin{bmatrix} 5 & 6 \\ 7 & 8 \end{bmatrix}$$

$$AB = \begin{bmatrix} 19 & 22 \\ 43 & 50 \end{bmatrix} \qquad BA = \begin{bmatrix} 23 & 34 \\ 31 & 64 \end{bmatrix}$$

Since $AB \neq BA$

this shows that matrix multiplication is non-commutative. This means order of multiplication matters, and we cannot swap the order of the matrices and expect the same result.

Q6. How scalar are different from vector.

Ans6 Scalar values represent a single quantity, such as color intensity, opacity or depth. Scalars are used to describe the properties of individual pixels, vertices or other elements in a 3D scene.

Vectors, represent more complex data such as position, direction or orientation.

Scalar and vector are manipulated differently in CG with scalar using arithmetic operation and vectors using more complex operations such as dot products cross products and matrix transformations

Q7 Given two vectors $\vec{a} = \begin{pmatrix} 1 \\ 4 \end{pmatrix}$ and $\vec{b} = \begin{pmatrix} 2 \\ 7 \end{pmatrix}$

Find $\vec{a} + \vec{b}$, $\vec{a} - \vec{b}$

Find $2\vec{a} + \vec{b}$, $\vec{a} - 2\vec{b}$

Ans7 $\vec{a} + \vec{b} = \begin{bmatrix} (1+2) \\ (4+7) \end{bmatrix} = \begin{bmatrix} 3 \\ 11 \end{bmatrix}$

$\vec{a} - \vec{b} = \begin{bmatrix} (1-2) \\ (4-7) \end{bmatrix} = \begin{bmatrix} -1 \\ -3 \end{bmatrix}$

$2\vec{a} + \vec{b} = \begin{bmatrix} 2+2 \\ 8+7 \end{bmatrix} = \begin{bmatrix} 4 \\ 15 \end{bmatrix}$

$\vec{a} - 2\vec{b} = \begin{bmatrix} (1-4) \\ (4-14) \end{bmatrix} = \begin{bmatrix} -3 \\ -10 \end{bmatrix}$

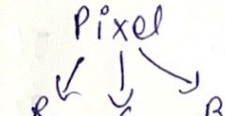
Q8 Compare DDA and Bresenham line drawing algorithm

Ans 8

DDA Line Algorithm	Bresenham line Algorithm
1) It stands for Digital Differential Analyzer	It has no full form
2) It is less efficient	It is more efficient
3) Calculation speed is less	Calculation speed is fast
4) It is costlier	It is cheaper
5) It has less percision or accuracy	It has more percision or accuracy
6) Complexity is more	Complexity is less
7) Optimization is not provided	Optimization is provided

Q9 Define

1) Pixel – Pixel is the smallest addressable screen element. It is the smallest piece of the display screen which we can control. The control is achieved by setting the intensity and colour of the pixel which compose the screen. Pixel is the smallest unit of display on video monitor Intensity of each pixel is variable



$2^8 = 2\times2\times2\times2\times2\times2\times2\times2 = 256$ numeric values

2) Resolution – The quality of the images printed or shown on a monitor is referred to as resolution. The resolution of a display is determined by counting the horizontal and vertical pixels. DPI is a resolution measured used by printers (dots per inch)

3) Aspect Ratio - It is the ratio of width to height of device eg aspect ratio of 3:1 means width of the graphic is three times of the height of the image.

4) Frame Buffer – Frame buffer is a part of RAM in a computer allocated to hold the graphics data of one frame of image. Image in frame buffer is read out by video controller to display on the screen.
Frame buffer size determines the maximum resolution and color depth of the image
FB size = resolution X color depth
eg $640 \times 480 \times 8$ bit = 2457600 bit
307200 byte

5) Raster Scan – It is also known as bitmap display. It works by dividing the display area into a grid of pixels and scanning each row of pixels from left to right and from top to bottom to create the image on the screen.
In a raster scan display, the e-beam from an e-gun inside the cathode ray tube moves across the screen horizontally, illuminating each pixel on the screen

sequentially. Once it reaches ~~horizontally~~ the end of row the beam is moved back to the beginning of the next row to continue the process. This process is repeated until the entire image is displayed on the screen.

Q10. Differentiate between

	Raster Scan	Random Scan
1)	It has high resolution	It has low resolution
2)	It is more expensive	It is less expensive
3)	Modification is easy	Modification is tough
4)	Solid pattern is tough to fill	Solid pattern is easy to fill
5)	Refresh rate depends on resolution	Refresh rate does not depend on the picture
6)	Only screen with view on an area is displayed	Whole screen is scanned
7)	Beam penetration technology come under it.	Shadow mask technology comes under this
8)	It does not use interlacing method	It uses interlacing
9)	It is restricted to line drawing applications	It is suitable for realistic display.