1.	**What is Computer Graphics?** It is a field of Computer Science that is concerned with digitally create and manipulate and represent visual contents.
2.	**Describe following terms:** **Picture Element (Pixel) :-** • It is the smallest addressable element on the computer screen. **Persistance:-** • It is define as the time taken by the emitted light from the screen to decay to 1/10 of its orignal intensity is called persistance. • High persistance requierd low refresh rate, and low persistance required high refresh rate. • Low persistance screen are used for animation and the high persistance screen are used of static images. **Resolution:-** • The no of pixels or points that can be displayed on the screen without overlap is called resolution. • It can also be defined as no of pixel per square inch. For Example 800*600, 1024*768, 1900*1080. **Aspect Ratio :-** • It gives the ratio of vertical points to horizontal points (pixel) necessary to produce equal length line in both of direction. • E.g. 3:4 aspect ratio may mean 3 pixel vertical and 4 pixel horizontal are required to draw equal length line.
3.	**Describe the application of Computer Graphics.** The following applications of computer graphics attempt to solve many of our day-to-day problems: • *Digital Art:* A Digital art refers to an art created on a computer in a digital form. A digital art can be purely computer generated or taken from another source like scanned photograph or image drawn using vector graphics software. • *Special Effects (SFX or SPFX):* Illusion used in film, television and entertainment and advertisement industries to simulate the imagined events in a story are traditionally called special effects. In modern films special effects are usually used to alter previously-filmed elements by adding, removing or enhancing objects within scene.

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- **Visual Effects (VFX):**
  Visual Effects means images or film frames are created and manipulated for film and video. Visual effects usually involve the integration of live action footage with computer generated imagery or other elements in order to create enviroments or scenarios which look realistic.

- **Video Games:**
  Video games find a good place in the gaming and animation industries.

- **Computer Aided Design (CAD):**
  It is used by civil, mechanical and electrical and electronics engineers to build models of buildings, bridges and printed circuit boards, etc.

- **Medical Imaging:**
  It can be used to train new doctors on understanding and experimenting surgery. It is used in molecular biology to study the biological model in genes.

Describe some popular Graphics Softwares.

Name of Software	Company	Purpose
Photoshop	Adobe	To create and manipulate raster images.
CorelDraw	Adobe	To create and manipulate vector images.
Paint	Microsoft	To create and manipulate static images.
Flash	Adobe	To create 2D animation for web pages.
3D Studio	Autodesk	To create 3D images and 3D Animations.
Auto CAD	AutoDesk	To create 2D Conceptual designing and 3D object rendering from concepts.
Animator Pro	AutoDesk	To create 2D animations.
Illustrator	Adobe	To create and manipulate vector images.
MAYA	Autodesk & Alias	High end 3D graphics and 3D modeling. Also used to create special effects and animation films.

4. Describe Pixel Graphics and Vector Graphics.   OR
Describe Raster (Bitmap) Graphics and Vector Graphics.

There are two kinds of computer graphics:
1. Raster (composed of pixels) also known as Bitmap images.
2. Vector (composed of paths)

1. **Raster Images :-**
➢ Bitmap images are pixel-based. It means location and color information about the image is stored in individual pixels within grid.

- In bitmap images, each pixel has an assigned color.
- The information stored in bitmap image regarding pixel location and color forms the image.
- Bitmap images are edited at the pixel level that allows the color of any one pixel to change.
- Bitmap images are usually created and edited in photo or paint programs such as Adobe Photoshop.
- Bitmap images are mapped to a grid or an array of pixels.
- The size of an image is based on the image's resolution.
- Bitmap images are not easily scalable.
- Bitmap images are used for photorealistic images and therefore, may involve complex color variations.

2. Vector Images :-

- Vector images are mathematically-based images. All lines, shapes, etc. (also called objects) of vector-based images are independent of one another.
- Vector-based images are created and edited in software like CorelDraw and Adobe Illustrator.
- Vector-based images have smooth edges and create curves and shapes.
- Vector-based images are good for precise illustrations, but are not as good as bitmap for photorealistic images.
- Vector-based images are easily scalable due to their use of mathematical formulas.

| 5. | **Describe Hard copy Output Devices.** |

Printers are the most commonly used output devices for producing hard copy output.

The various types of printers in used today are :-

1. Dot-Matrix Printers
2. Inkjet Printers
3. Drum Printers
4. Laser Printers
5. Dot-Matrix Printers

- ❖ Refer Section 1.5 Hard Copy Output Devices of Chapter-1 Overview of Computer Graphics from Book of Computer Graphics by Apurva A. Desai

| 6. | **Describe Cathode Ray Tube.** |

CRT

A cathode ray tube (CRT) is a specialized vacuum tube in which images are produced when an electron beam strikes a phosphorescent surface. Most desktop computer displays make use of CRTs. The CRT in a computer display is similar to the "picture tube" in a television receiver.

All CRT's have three main elements: an electron gun, a deflection system, and a screen. The electron gun provides an electron beam, which is a highly concentrated stream of electrons. The deflection system positions the electron beam on the screen, and the screen displays a small spot of light at the

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point where the electron beam strikes it.

Refresh CRT

A beam of electrons (cathode rays), emitted by an electron gun, passes through focusing and deflection systems that direct the beam towards specified position on the phosphor-coated screen. The phosphor then emits a small spot of light at each position contacted by the electron beam. Because the light emitted by the phosphor fades very rapidly, some method is needed for maintaining the screen picture. One way to keep the phosphor glowing is to redraw the picture repeatedly by quickly directing the electron beam back over the same points. This type of display is called a refresh CRT.

Basic Operation of a CRT

The basic operation of CRT is shown in figure below:
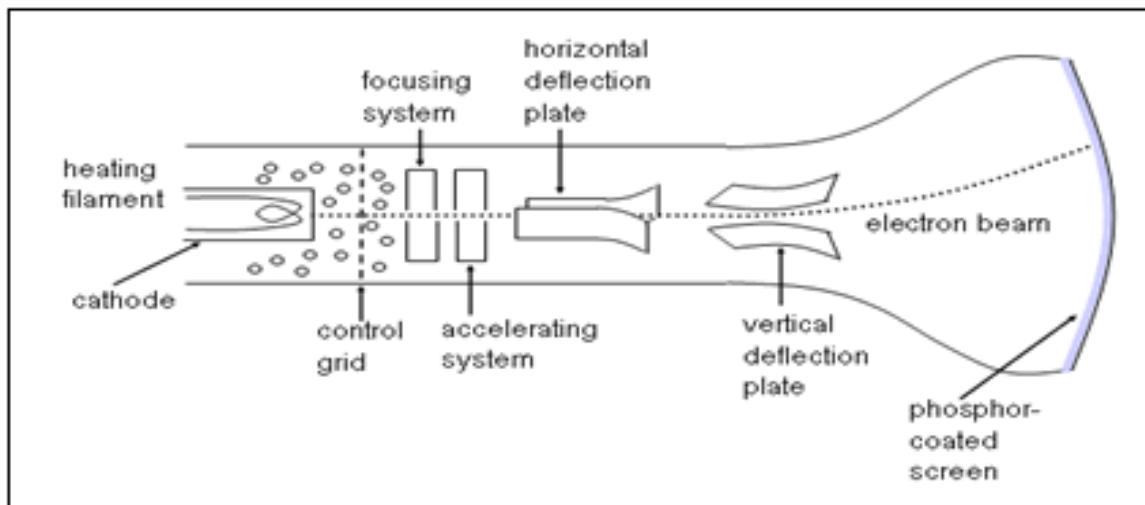
Electron Gun

The primary components of an electron gun in a CRT are the heated metal cathode and a control grid. The cathod is heated by an electric current passed through a coil of wire called the filament. This causes electrons to be boiled off the hot cathode surface. In the vacuum inside the CRT envelope, negatively charged electrons are then accelerated toward the phosphor coating by a high positive voltage. The accelerating voltage can be generated with a positively charged metal coating on the in side of the CRT envelope near the phosphor screen, or an accelerating anode can be used. Sometimes the electron gun is built to contain the accelerating anode and focusing system within the same unit.

Focusing System

The focusing system is ised to create a clear picture by focusing the electrons into a narrow beam. Otherwise, electrons would repel each other and beam would spread out as it reaches the screen. Focusing is acomplished with either electric or magnetic fields.

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Deflection System

Deflection of the electron beam can be controlled by either electric fields or magnetic fields. In case of magnetic field, two pairs of coils are used, one for horizontal deflection and other for vertical deflection. In case of electric field, two pairs of parallel plates are used, one for horizontal deflection and second for vertical deflection as shown in figure above.

CRT Screen

The inside of the large end of a CRT is coated with a fluorescent material that gives off light when struck by electrons. When the electrons in the beam is collides with phosphor coating screen, they stopped and their kinetic energy is absorbed by the phosphor. Then a part of beam energy is converted into heat energy and the remainder part causes the electrons in the phospor atom to move up to higher energy levels. After a short time the excited electrons come back to their ground state. During this period, we see a glowing spot that quickly fades after all excited electrons are returned to their ground state.