i) Explain architecture of Raster Scan Display :

=> In raster scan the electron beam follows a fixed path. The electron beam starts at top left corner of the screen and moves horizontally to the right. This defines a scan line. During the scan the intensity of the beam is modulated according to the pattern of the desired image along the line.

At the right corner of the screen, the beam becomes off, and moved back to the left edge of the screen at the starting point on next line. This is shown as dotted line which is called as horizontal retrace. This way of scanning is continued to the bottomed right corner is reached. At this point, one scan is completed. The beam is then repositioned at the top left corner of the screen for starting another scan. This movement of beam from bottom right corner to top left corner is called as vertical retrace.

ii) Describe applications of computer graphics :

=> A) Virtual Reality :
With the help of computer graphics. It is possible to stimulate various virtual environments which looks seamlessly similar to real world. Such environment helps to train the person without providing them with physical resources. Doctors can be trained to operate a patient without operating on the actual physical body.

B) Presentation graphics:

Another major application of CG is presentation graphics. It is used for producing diagrams, tables and charts for reports or presentations. It is generally used to summarize research or survey data. 3D graphics are sometimes used to provide multi angle analysis of statistical data.

C) Computer art:

CG plays a major role in fine art and commerical art various computer methods. Symbolic package CAD packages are used by designer to generate computer art. Using such packages the artist can easily design shapes and can add motion.

D) Entertainment:

CG are commonly used in film industries for making animation and carteen movies, for providing effects to the scene, television, etc. Sometimes the character itself is displayed as graphic object and sometimes it is cart combined with real scene and synthesized objects.

E) Education and training:

Another application of CG is education and training Nowadays in market many educational toolkits are available for child education. They can learn through videos and animation. Training a person for vechile such as driving using such simulators saves his time and efforts.

ix) Differentiate between random scan display and raster scan display

Raster Scan System	Random Scan System
1. The electron beam scans the entire screen to draw a picture.	The electron beam scans only the part of the screen where pic information is present.
2. The video controller is required.	Video controller is not required.
3. Used to display a dynamic scene.	Used to display static picture.
4. Scan conversion is required.	Scan conversion is not required.
5. The refresh rate is independent of no. of objects in scene.	When numbers of primitives are too large random scan device flickers.
6. Pixel / spatial location of screen is used to draw an image.	Mathematical functions are used to draw an image.
7. Economical	Costly.

Q) What is Aliasing? Explain techniques of antialising.

⇒ When straight lines are drawn on monitor it appears zig-zag. This effect is called aliasing, happens due to poor algorithm or hardware limitation.

zig-zag lines on screen gives the illusion of smooth line that effect is called anti-aliasing. Line or on paper looks smooth and continuous by when they are rendered on monitor screen. Creates discrete zig-zag appearance due to grid structure.

We can apply certain technique which will reduce the aliasing effect. We can achieve antialising either by increasing the screen resolution or by applying smart algorithm to complete the pixel locations on the shape boundary.

Techniques of antialising:

① **Prefiltering**: It is known as area sampling. In this, intensity of pixel is determined by area of pixel covered by the object.

a) **Unweighted area sampling**
A line passes through two pixels and algorithm illuminates the pixel which is closer to the line. unweighted line sampling is extension of this concept which reduces the aliasing effect. This method illuminates both the pixel with diff. intensities.

b) Weighted area Sampling: (super Sampling).

In this method, single pixel is mapped to imagine high resolution mask. Each mask position is weight as per the pixel position covered by the mask.

Pixel is divided into imaginary high resolution mask. Each mask location is weight as per the the pixel position covered by the mask.

Pixel is divided into imaginary grid and each grid location is assigned weight according to area covered by the pixel.

Average intensity of imaginary grid is placed back to original pixel location.

original line on the screen is shown.
It is very much clear that the line does
not interpolate pixels perfectly.
Some of the pixels are on the edge of
the line, some are on the line and some
are missing the line.

line with original pixel position.

whereas the supersampled and enhanced
views of some random pixel, we have
divided the pixel in 3x3 imaginary
grid. Value in each cell indicates
the percentage of area covered by
line pixel.

view of super sampled pixel.

1/3	2/3	1
3/0	1	0
2/3	5/7	0