

Q 1 Describe the parts of a digital fluoroscopy imaging system and explain their function

Ans

⇒ Parts of digital fluoroscopy imaging.

⇒ The key components include an x-ray tube, spectral shaping filters, a field restriction device (aka collimator), an anti-scatter grid, an image receptor, an image processing computer and a display device.

### Parts

- ✱ monitor
- ✱ video camera
- ✱ optical coupling
- ✱ image intensifier
- ✱ Grid
- ✱ Patient
- ✱ Table
- ✱ filtration

## ⇒ Monitor :

⇒ We can view the area being examined while it is moving and functioning on a computer monitor.

## ⇒ Grid

Grid are placed between the patient and the x-ray film to reduce the scattered radiation reaching the detector (produced mainly by the Compton effect) and thus improve image contrast.

## Optical Coupling

The Fluoroscopic system an image intensifier is coupled to record cameras. The optical distributor is responsible for transmitting a focused image intensifier to the focal planes of the cameras.

## Image Intensifier.

The x-ray image intensifier is electronic device that converts



that convert the x-ray beam intensity pattern (remnant beam) into a visible image suitable for capture by video camera and displayed on video display monitor.

**Filters:** are metal placed in the x-ray beam between the window and the low-energy (soft) x-ray photon from the spectrum - using filter reduce the ESD and to a lesser extent effective dose for patient.

### **Video Camera**

convert light photon into electronic signal



Q2: Explain the four prime exposure factors

Ans The quantity and quality of the x-ray beam are controlled by four prime factors. These factors under the direct control of the limited operator. The prime factors of exposure are milliamperage (mA), exposure time (s), kVp, and SID.

### milliamperage (mA)

- 1) Control the radiographic density.
- 2) Control quantity of x-ray produced controlled by adjusted the filament heat.
- 3) Quantity of exposure is directly proportional to mA.

### Exposure time (Second)

- 1) Control radiographic density
- 2) control quantity of x-ray produced.

⇒ Controlled by adjust the timer  
in x-ray circuit.

### Kilovolts (kvp)

Control the radiographic contrast.

Control x-ray Penetration.

Control the quantity and quality  
of the x-ray beam.

Increased kvp results in increased  
quantity of photons.

Increased kvp result kvp  
increased penetration of the body  
part

### Source-image Receptor Distance (SID)

Affect and intensity of the  
x-ray beam.

Quantity of exposure is  
inversely proportional to the square  
of the distance.



Q 3: Identify four image quality factors and explain how they influence the characteristic radiograph.

Ans Image Quality Factors.

Image quality factors refer to (3D) characteristic of the image contrast, image detail, and distortion.

**Optical Density.**

⇒ optical density can be controlled by two major factors: MAS and SID.

⇒ Optical density is property of Transparen material.

= OD it is of speed of light through two material speed of light decreases in a medium while it increases in vac.

**Image Contrast.**

⇒ the function contrast is the image is to anatomy more visible.

⇒ Kvp the major factor used in controlling radiographs contrast.



⇒ High Contrast Radiographs Produces Short grayscale.

## Image Detail.

⇒ the Sharpness a appearance of small structure on the radiograph.

⇒ image detail must be evaluated by two means.

Sharpness of image detail and visibility of image detail.

⇒ Sharpness of image detail best measured by Spatial resolution.

⇒ the visibility of image detail best measured Contrast resolution.

## Distortion

The misrepresentation.

⇒ Distortion is reduced by Positioning to anatomical Part of interest in a plane Parallel to that of the Image receptor.

Q4) Describe the Component of an image intensifier.

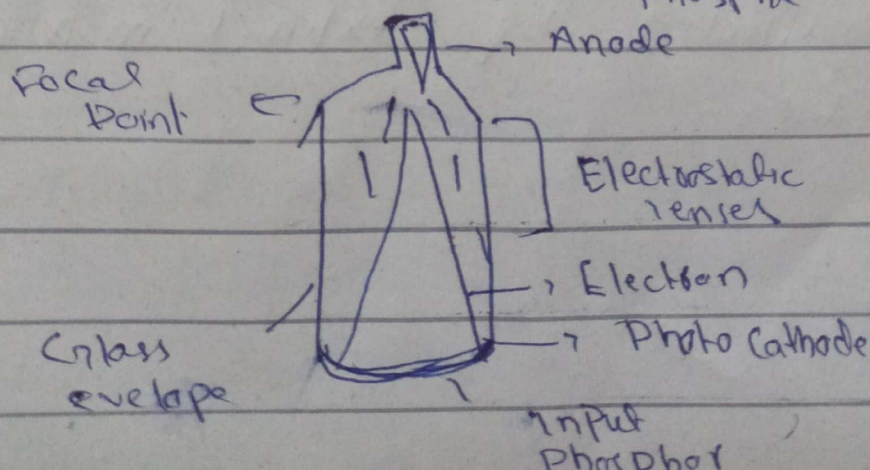
Ans Image- intensifier tube

The image intensifier tube is complex electronic device that receive the image-forming x-ray beam and converts into visible-light image-intensifier. When installed tube mounted inside a metal container to protect it from rough handling and breakage.

=> When x-ray interact with the input phosphor - its energy is converted into energy light.

Image intensifier tube

Output Phosphor, Anode, Focal Point





- ⇒ The Photo cathode emits electrons when illuminated by the input phosphor.
- ⇒ The output phosphor is the where accelerated electron interacted and produced.

Q5) A) Enumerate the advantage flat panel image receptor.  
Advantages of flat panel image receptor.

- \* Distortion-free image
- constant image quality over the entire image
- High DQE at all radiation dose levels
- rectangular image areas coupled to similar image monitor
- unaffected by external magnetic fields.



Q5)

b)

Describe the Properties and use of a charge-coupled device.

Ans

A major change from conventional Fluoroscopy (CCD) instead of a TV camera Tube.

⇒

The sensitive component of a CCD is a layer crystalline Silicon

⇒

The spatial resolution of CCD is determined by its physical size and pixel count.

Television camera tube, can show spatial distortion in what described as "pin cushion"



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