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Question (1)

Ans

Digital Fluoroscopy System:-

Advantages of digital fluoroscopy over conventional fluoroscopy include the speed of image acquisition and post processing to enhance image contrast.

Digital fluoroscopy is currently most commonly configured a conventional fluoroscopy system. A computer has been added, as have multiple monitors and a more complex operating console.

Charge - Coupled Device (CCD)

* A major change from conventional fluoroscopy to DF is the use of a charge - coupled Device (CCD) instead of a TV camera tube.
* The sensitive component of a CCD is a layer of crystalline silicon.
* The CCD has greater sensitivity to light a lower level of electronic

noise than a television camera tube.

* The response of the CCD to light is very stable. warm up of the CCD is not required.

Flat panel Image Receptor :-

* The further improvement of DF imaging is developing that flat panel Image receptor (FPIR)
* Such an Image receptor is composed of cesium iodide pixels.
* Flat-panel detector are more sensitive and faster than film. As tube were replaced by CCD, now, CCD will be by FPIRs is smaller,

Collimation :-

Shutters that limit the geometric extent of the x-ray field are present in all x-ray equipment. In fluoroscopy, the collimation may be circular or rectangular in shape, matching the shape of Image Receptor.

Beam Filtration :-

It is common for fluoroscopic imaging system to be equiped with beam hardoning filters between the x-ray tube exit port and the collimator.

Question (2)

Ans Four prime Exposure are :-

1) Kilovolt Peak (kvp) :-

* kvp control Screen film radiographic contrast
* Beam penetability.
* The kvp has more effect than any other factor on Image receptor exposure.
* controls, quality, penetability & contrast
* Base kvp influence OD?
* kvp control energy (quality) of x-ray beam.

2) Exposure Time :-

* Radiographic exposure time usually are kept as short as possible.
* mA Xs = mAs
* mAs controls OD
* mAs determines the number of photons in the primary beam.

3) Milliamperes :-

* The mA Selected determines the number of x-ray produced and therefore the radiation quantity.
* As more electron flow through the x-ray tube, more x-ray are produced
* x-ray quality remain fixed with a change in mA.

* changing mA does not change the Kinetic energy of $\bar{e}$
* Available mA stations are usually 50, 100, 200, 300, 400, & 600 (for a Spot Size).

4) **Distance :-**

* Distance has no effect on radiation quality.
* Distance (SID) affects OD.

Question (3)

Image quallity factors :-

Image quality factors refes to characteristic of the radiographic image : These include.

1) Optical Density.
2) contrast
3) Image detail
4) Distobation.

characteristic of the radiograph

1) Optical Density :-

* optical density is the degree of blackening of the finished radiograph.
* This situation result when too much x radiation reaches the image receptor.
* optical density can be controlled in radiograph by two major factors. mAs and SID.

2) Contrast :-

The function of contrast in the image is to make anatomy is more visible.

* Contrast is the difference in OD between adjacent anatomical structure, or the variation in OD on a radiograph.

3) **Image Detail :-**

Detail describe the sharpness of appearence of small structure in the radiograph with adequate detail, even the smallest part of the anatomy are visible, and the radiograph can more readily detect tissue abnormal

* sharpness of image detail refers to the structural lines or borders of tissue in the image

* sharpness of image detail is best measured by spatial resolution.

4) **Distoration :-**

* The misrepresentation of object size and shape on the radiograph. Because of the position of the x-ray tube, the anatomical part and the image receptor, The final image misrepresentation the object.

* Distoration is reduced by positioning the anatomical part of interest in a plane parallel to that of the image receptor.

Question (4)

Image Intensifier Component.

An Image intensifier consist of the following major components an Input widow, an input phosphor and photocathode several electrostatic focusing lenses. an accelerating anode.

1) Input window :-

The shape and choice of material for the Input window result for the compromise among many factors, such as minimizing patient distance, x-ray absorption, x ray scatter, manufacturing cost and mechanical strength of materials. The input side of the image intensifier usually has convex shape and is generally made of aluminum.

Input phosphors and photocathode :-

x-ray transmitted through the input window are converted into fluorescent light photons by the input phosphors. The input screen is a substrate made of aluminium coated with a phosphors layer,

an intermediate coupling layer. and finally the photocathode layer

Electronic optics :-

photoelectrons are accelerated from the photo cathode to the output phosphour by the anode. The accelerated photoelectrons are focused down to the size of the output phosphor by a series of electrostatic focusing electrodes.

Output phosphour and windows :-

The output phosphour of the x-ray Image intensifier. which typically is called P20, A fluorescent compound made of Silver- activated zinc-cadmium sulfide. The emission spectrum of P20 is at a maximum around 530 nm. The P20 layer is very thin. having a thickness of 4- 8 μm, and is deposited on the glass output windows.

Image Intensifier Housing :-

The x-ray Image intensifier is enclosed in a metal housing consisting of lead to absorb scattered radiation mu-metal to shield the electron

optics from extraneous magnetic fields, and an outer aluminium shell. On the input side of the housing, the aluminium shell. On the input side of the housing. The aluminium shell protects the output image intensifier.

Question (5)

(part A)

Advantages of the Flat panel Image Receptor

1) Flat panel Image receptors are more sensitive than others.
2) FPIR are considered as faster detector compared to others.
3) lower dose rotation for a given Image quality.
4) Due to their sensitive. This allows a lower dose radiation.
5) They are more durable.
6) They are lighter in height.
7) FPIR provide more accurate results compared to others.

8) FDR are Smaller in volume

9) No cassette is Required

10) provides easy manipulation for patient and radiologist.

Question (5)

(past B)

Ans

properties of CCDs

The most common detector used on telescopes today is called the CCD (Charge-coupled Device). It is basically a computer chip that function is an electronic camera and those used in astronomy are very similar to those used in digital cameras. It consist of a 2-D array of highly efficient light detectors that count incoming photons at each location on the chip and output at 2-D array of numbers that can easily be stored on a computer. The stimulation to the right allow one to view the output of a star on a CCD and vary the CCD properties.

Uses of CCDs :-

- Because CCD based detector and camera are used in various microscope and Imaging Systems.
- One of the big application areas is the life science and medical fields.
- This is where these Imaging System are used the most.
- The application in this area are too vast to mention every single one, as these Imaging System can be used across all aspect of the life Sciences and on almost all biomolecules.