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Paper : General Radiology

### Question - 1

Answer: The part of digital fluoroscopy imaging system.

- 1- Monitor
- 2- Video camera
- 3- optical coupling
- 4- Image Intensifier
- 5- Grid
- 6- Patient
- 7- Table
- 8- Filtration
- 9- Collimator
- 10- X-ray tube
- 11- X-ray Generation

### Function of digital Fluoroscopy imaging system.

1. **X-ray source:** The high voltage generator and X-ray tube used in most fluoroscopy system is similar in design

and construction to tubes used for general radiographic application. For special purpose booms such as those used for cardiovascular imaging extra heat capacity is needed to allow angiography "runs" sequences of higher dose radiographic images acquired in rapid succession to visualize opacified vessels. These runs are often interspersed with fluoroscopic imaging in a diagnostic or interventional procedure and the combination can result in a higher demand on the x-ray tube.

Focal spot size in fluoroscopic tubes can be as small as 0.3 mm and as large as 1.0 or 1.2 mm where higher power is needed.

**Beam filtration:** It is a common for fluoroscopic imaging system to be equipped with beam harden filtration between the x-ray tube exit port and the collimator. Added ~~also~~ aluminum and/or copper filtration can reduce skin dose at the patient's exit entrance surface while a low kVp produces a spectral shape that is well matched to the barium or iodine k-edge for high contrast in the anatomy of interest.

Collimation is a shutter that limits the geometric extent of the x-ray field. It is present in all x-ray equipment. In fluoroscopy, the collimation may be circular or rectangular in shape, matching the shape of the image receptor.

**Patient Table and pad:** Patient tables must provide strength to support patients and are rated by the manufacturer for a particular weight limit. It is important that the table not absorb much radiation to avoid shadows, loss of signal and loss of contrast in the image.

**Anti-scatter Grid:** are standard components in fluoroscopic systems. Since a large percentage of fluoroscopic examinations are performed in high-scatter conditions, such as in the abdominal region. Typical grid ratios range from 6:1 to 10:1.

**Image Receptor - X-ray image intensifier:** The x-ray image intensifier is an electronic device that converts the x-ray beam intensity pattern into a visible image suitable for capture by video camera and display monitor.

**IMAGE DISPLAY:** Fluoroscopy requires that allow users to appreciate fine details and subtle contrast differences in the anatomy of interest.

**QUESTION :: 2**

**Answer:** The four prime exposure factors:-

- 1 - Kilovoltage Peak (kVp)
- 2 - Current (mA)
- 3 - Exposure time
- 4 - Source-to-image receptor distance (SID)

**Kilovoltage Peak (kVp):**

kVp controls screen film radiographic contrast.

**Beam penetrability:**

The kVp more effect than any other factor on image receptor exposure. kVp increases, less differential absorption occurs. therefore high kVp result

In reduced image contrast.

**2 Milliampere:** The MA selected determines the number of x-ray produced and therefore the radiation quantity. As more electrons flow through the X-ray tube, more x-rays are produced. With a constant exposure time, MA controls the x-ray quantity and therefore the patient radiation dose.

**3 Exposure Time:** Radiographic exposure times usually are kept as short as possible. The purpose is not minimize patient radiation dose but rather to minimize motion blur that can occur because of patient motion.

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

Question 3

Answer: Four Image quality factors:

An increase in  
KVP  
Milliampere

X-ray Quality  
increase  
No change

Exposure time	No change
Distance	No change

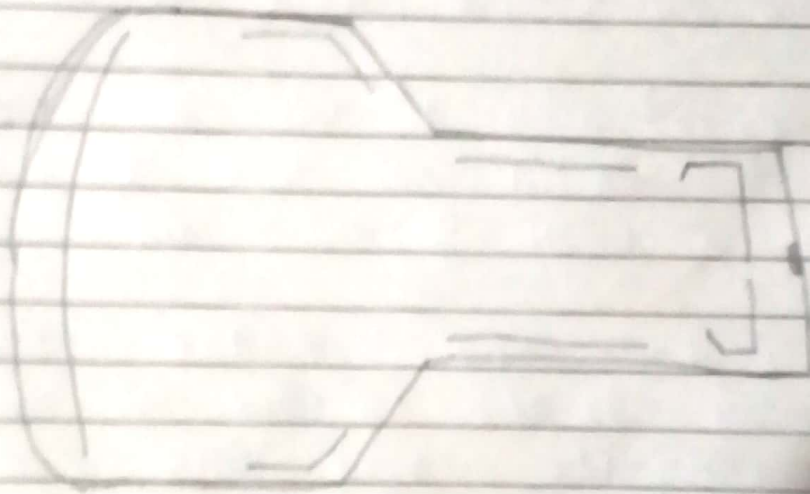
The clarity and sharpness of the image is a true representation of the subject. These features make up the four elements of radiographic quality.

- 1- Density
- 2- contrast
- 3- Detail
- 4- distortion

The quality of a medical image is determined by the image method, the characteristic of the equipment and the image variable selected by the operator.

## Question 4

Answer: Component of an  
Image intensifier:



- 1- Input window
- 2- Electron lenses
- 3- Output window
- 4- output phosphor
- 5- Anode
- 6- substrate

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2 input phosphor

8 Photocathode.

## Question 5

### Part A

**Answer:**.. Flat panel detectors are more sensitive and faster than film.

- Their sensitivity allows a lower dose of radiation to a given picture quality than film.

- For Fluoroscopy they are lighter, less durable, smaller in volume more accurate, and have much less image distortion than x-ray image intensifiers.

### Part B

**Answer:**.. Charge-coupled device  
Properties:

The most common used detector used on telescopes today is called the CCD. Due to the higher quantum efficiencies of charge coupled device (CCD) the ideal quantum



efficiency is 100%, one generated electron per incident photon linearity of their outputs, ease of use compared to photographic plates and a variety of other reasons CCDs were very rapidly adopted

## USES of Charge coupled Device:

CCD are used in many imaging applications, such as surveillance hand-held and desktop computer video cameras, and document scanners.