MARIA NAN
ID#14577
BS: RADIOLOGY
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MAM: MAHEEN GUL

Question 1:-

Difference between Spatial Resolution and Contrast Resolution?

Spatial	Contrast .....
⇒ Spatial Resolution is the ability of an imaging System to Resolve and Render on the image a small high-Contrast objects.	Contrast Resolution is the ability to Distinguish many shades of gray from black to white.
⇒ Black on white in high Contrast	⇒ The Contrast of an image is affected by the properities of the Receptors used to form the image.
→ Spatial Resolution losses occur because of blurring caused by geometric Factors (e.g the size of the modality, Focal spot,	Contrast Resolution also known as Contrast media are used

light diffusion in the Receptor. The more blurring, the lower is the Resolution

⇒ In medical imaging Spatial Resolution is described by the quantity "Spatial Frequency".

⇒ The Spatial Resolution of the eye is Described as 200 µm.

⇒ Spatial Resolution Refers to the Number of pixels utilized in Construction of the image. image having higher Spatial Resolution are Composed with a greater Number of pixels then those of lower Spatial Resolution.

→ low Resolution: over 60m/pixel

→ Medium ": 10-30m/pixel

→ High to verghig Resoluti 30cm/5cm Pixel

During medical imaging Examination to highlight Specific part of the body and make them easier to see -

→ All Digital imaging System have better Contrast Resolution than Screen-Film imaging. The principal descriptor for Contrast Resolution is gray Scale, also Called Dynamic Range.

→ Contrast Resolution of a digital image is given by the Number of possible pixel values, and is defined as the Number of bits per pixel value

→ High Contrast object of increasing Smaller sizes (increasing Spatial frequency)

Question 2:-

Discess the characteristics of digital imaging that should & Result in lower patient Radiation Dose?

Characteristics of Digital imaging:-

→ A Digital image is made of a 2D array of Number called a matrix.

⇒ A Digital image has Four basic characteristics or fundamental parameters,

matrix, pixel, voxels and bit Depth

(1) Pixel:-

A pixel or picture element, is the Smallest element in a digital image. If you have ever magnified a digital picture to the point that you See the image as Small Squares of Color, ~~you have See~~ Spatially, the digital image is Seperated into pixels with discrete. The proces of associating the pixels with discreate values defins maximum Contrast Resolution

(2) Matrix:-

A matrix is a Square arrangement

of Number in Columns and rows, and in digital imaging, the Number corresponds to discrete pixel values.

→ A Digital image is a matrix of many small elements, or pixels

⇒ The advantage of Digital images is that they can be processed in many ways, by Computer System.

Result in lower Patient Dose:

⇒ All Digital imaging, we have the opportunity to Reduce patient Doses by 20% to 50% Depending on the Examination.

⇒ Digital imaging can always yield a good image, it is possible for the Radiologic technologist to be unwittingly lured into not adjusting exposure as Free-quently as with Screen Film.

Example:

By Not changing Factors between a lateral view and an anteroposterior view when these are taken, As a Result, it is possible for the overall patient Dose to increase,

Patient Radiation Dose

Reduction should be possible because of the manner in which the digital image Receptor Responds to x-rays and because of a property of the digital image Receptor know as DQE.

Question 3:-

Dissuss the Features of an active matrix liquid crystal Display?

⇒ An active matrix liquid crystal display is a type of flat-panel display, the only viable technology for high Resolution TVs, Computer monitors, Notebook Computers, tablet Computers, and Smartphones with an LCD Screen, due to low weight, very good image quality, wide color gamut and Response Time.

Features:-

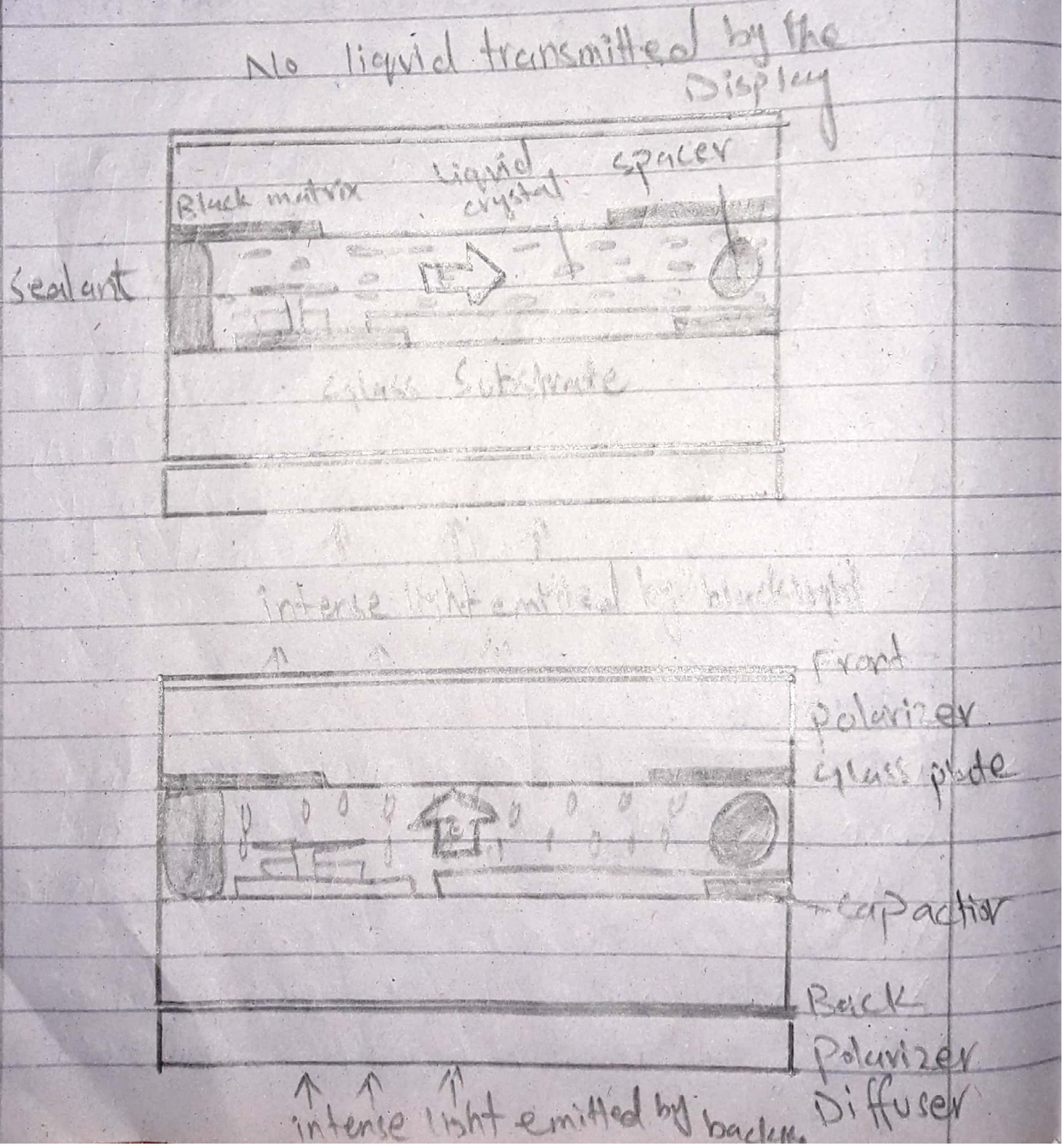
⇒ we all know that matter takes the form of gas, liquid or solid, A liquid crystal is a material state between the that of a liquid and Solid.

⇒ A liquid crystal has the property of a highly ordered molecular structures

a crystal and the property of viscosity a fluid.

⇒ Liquid crystal materials are linear organic molecules that are electrically charged, forming a natural molecular dipole. Consequently, the liquid crystals can be aligned through the action of an external electric field.

⇒ AMLCDs are superior to CRT displays



Question 4:-

Discess the three types of Digital Radiographic imaging artifacts and how to avoid them?

Digital ARTIFACTS:-

→ An artifacts is any false visual Feature on a medical image that simulates tissues or obscures tissue.

→ Artifacts interfere with diagnosis and must be avoided.

→ Similar to accidents, artifacts are, by definition avoidable

→ Artifacts can be controlled when the cause of the artifacts is understood.

→ Three Digital imaging artifacts

① Image Receptor
② Software
③ object

① Image Receptor:-

→ Digital image Receptor can suffer from Rough handling scratches, and dust.

→ Artifacts produced by dust can be corrected easily with proper cleaning unless the dust is internal to the

optics of a Computed Radiography imaging System.

=> Dust on any Section of the CR optical Path- mirrors and lenses Cannot be corrected by the Radiologic technologist and will Require professional Service.

=> If a CR IP has not been used for 24 hours, it should be erased again before use.

=> when a completely erased IP is processed, the Resulting image should be uniform and artifact free.

=> Rough handling or faulty Construction of a digital IP can Result in artifacts.

(2) SOFTware Artifacts:-

=> Digital Radiographic image are obtained as Raw data sets.

=> As Such, these image are Ready "For processing."

=> For-processing images are manipulated into "for presentation" image that the Radiological technologist Can use for QC and for interpretation by the Radiologist.

(1) Preprocessing Artifacts
(2) Image Compression

(3) Object Artifacts:-

→ object artifacts can arise from the technologist's errors in patient positioning, x-ray beam collimation, and histogram selection.

→ Backscatter Radiation also can be troublesome because of the sensitivity of the digital Radiographic image Receptor.

→ If a lot of scattering material is present behind the image Receptor, backscatter Radiation can cause a phantom image, if this type of artifacts is discovered, the back side of the image Receptor should be shielded to Reduce backscatter x-rays.

Question 5:-

Explain how digital Radiographic image artifacts occurs because of improper collimation partition or aligment?

OBject Artifacts:-

→ object artifacts can arise from the technologists errors in patient positiong x-ray beam collimitten and histograms Seledtion. Backscatter Radiation also can be troublesome because of the sensitivity of the Digital Radiographic image Receptor

→ Collimation and Partition

→ Alignments

→ **Collimation and partition:-**

→ If the x-ray exposure field is not properly collimated, sized, and positioned exposure field Recongition errors may occurs

→ The Result is very dark or very light or very noisy imeages

→ Automatic Radiation field Recongnition is essential for artifacts free imeages

→ Collimation of the projected area x-ray

beam is important for patient Radiation Dose Reduction and for improved image Contrast is Screen-Film Radiography.

→ In DR, proper collimation has the added value of Defining the image histogram. If improperly collimated the histogram can be improperly analyzed, Result in an artifacts.

→ proper collimation and Centering prevent histogram errors that can lead to artifacts.

→ partitioning of multiple digital image on a Single IP Result in proper Separation and collimation of each image.

→ Alignment:-

→ Alignment of the exposure field on the IP is important in the Same way and for the Same Reason as collimation.

→ when an image field, Such as that shown in is not oriented with the Size and dimensions of the IP, image artifacts, Can appear,

Question 6:-

Identify application of the picture archiving and communication system?

→ Radiology is adopting digital imaging very Rapidly. Estimates of the present level of digitally acquired images Range up to 90%. These digital image come from every area of medical imaging, including Nuclear medicine, diagnostic ultrasonography, Radiography, fluoroscopy, CT, and MRI.

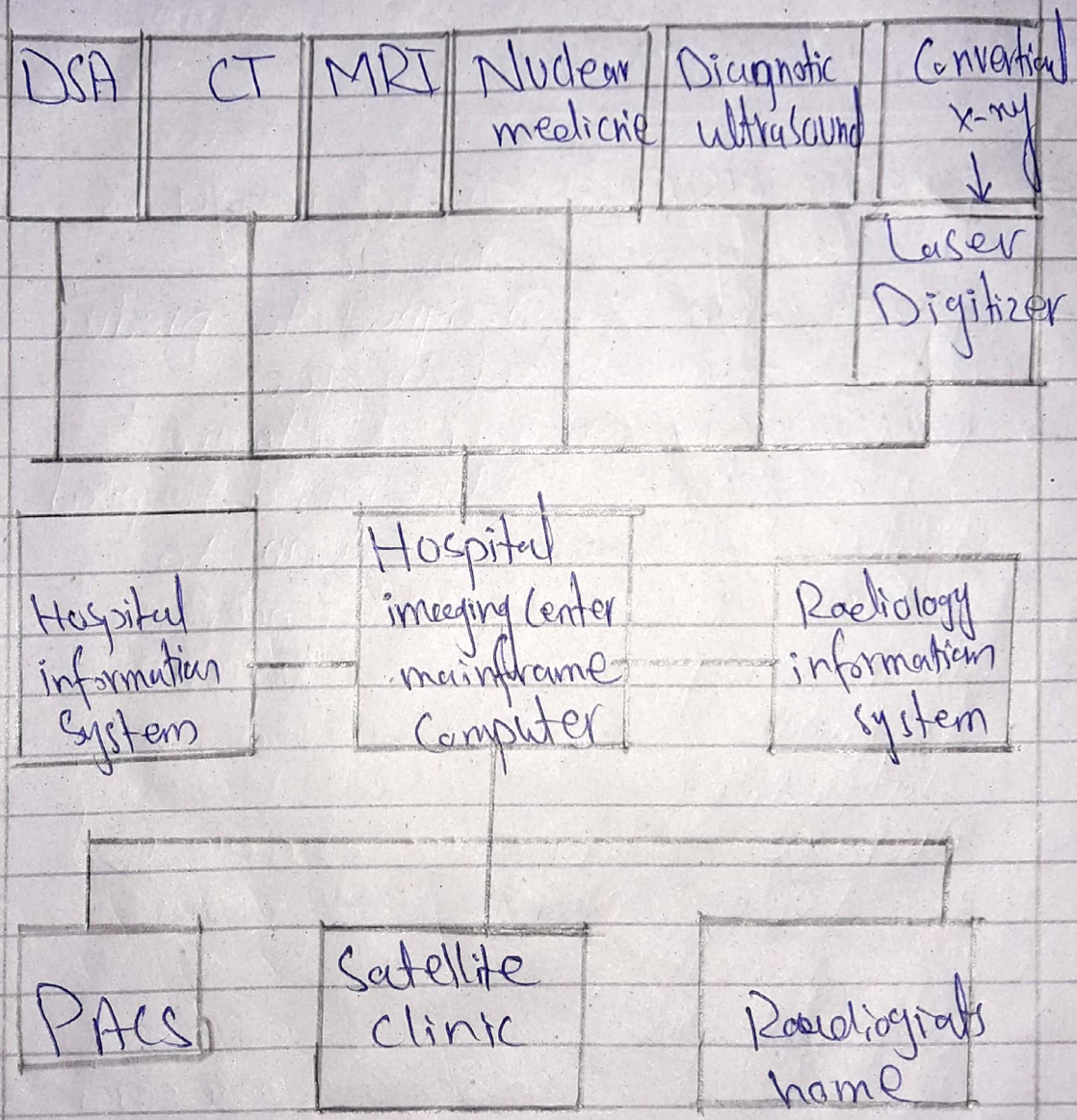
→ A picture archiving and communction system, when fully implemented. allows not only the acquisition but also the interpretation and storage of each medical image in digital form without Resorting to film (hard copy) The projected efficiencies of time and cost are enormous.

→ PACS improves image interpretation, processing, viewing, storage and Recall

→ Four principal of PACS

① Network:-

1. Network
2. Storeage System
3. Display System
4. imeage acquisition System



Question 7:-

Describe the Features of preprocessing and postprocessing?

Preprocessing:-

⇒ preprocessing of digital images is largely automatic.

→ preprocessing is Designed to produce artifact-free digital image.

→ preprocessing provides electronic calibration to Reduce pixel to pixel Row-to Row and Column to Column Response Difference.

⇒ These preprocessing calibration techniques are identified as flatfielding

⇒ Average techniques also are used to Reduce Noise and improve Contrast.

⇒ Defective pixel
Interpolate adjacent pixel Signals

→ Image lag
offset Correction

→ Line Noise
Correct from dark Reference Zone

→ Digital image Receptor and display devices have millions of pixels, Such defects are Corrected by signal interpolation.

→ Each type of Digital image Receptor generally are electronic latent image that may not be made visible Completely.

→ Some voltage variations may be seen along the buss that drive each pixel, This defect called line Noise.

→ The Solution is to apply a voltage Correction from a row or a Column of Pixel in a dark, unirradiated area of the image Receptor.

Postprocessing:-

⇒ Postprocessing of digital images Requires operator manipulation

→ Postprocessing is where digital imaging shines, In Contrast to preprocessing

→ which is largely automatic, Postprocessing Requires intervention by the Radiologic technologist and the Radiologist

→ Postprocessing Refers to anything that can be done to a digital Radiographic image after it is acquired by the imaging system.

→ Postprocessing of the digital Radiographic image is performed to optimize the appearance of the image for the purpose of better detecting pathology.

⇒ Annotation
Label the image

→ Window and level
Expand the digital grayscale to visible

→ Magnification
improve visualization and spatial Resolution

→ image flip
Reorient image presentation

→ image inversion
Make white – black and black – white

→ Subtraction (DSA) pixel shift
improve image Contrast
Reregister an image to correct for patient motion

→ Region of intest – Determine average pixel value for use in quantitive imaging

Question 8:-

FOR-Processing and PRE-Presentation of an images

⇒ For processing images are manipulated for presentation images that the Radiologic technologist can use for QC and for interpretation by the Radiologist.

⇒ Before an image is prepared for process several manipulation of the output of an image Receptor may be Necessary to correct for potential artifacts.

→

⇒ Such artifacts can occur because of dead pixels/ dead Rows / Columns

→ Because of dead pixel or dead rows and Columns of pixels

→ A Single pixel or a Single Row

or Column Normally will not inferter with Dignoses.

→ Many of these defects must be corrected.

Question 9:-

Describe the basis for Data compression and the Difference between lossless and lossy Compression.

Basic For Compresion	Lossy Compression	Lossless Compression
→ Basic	Lossy Compression is the family of Data encoding method that Utilizes imprecise estimates to Represent to Represent the Contents	lossless Compression is a group of Data Compression algorithms that permits the original data to be accurately Rebuilt from the Compressed Data.
→ Algorthm	Transform Coding, DCT, DWT, Fractal Compression RSSMS,	RLW, LZW, Arithmetic encoding, Huffman encoding Shannon Fano Coding
→ Used in	image, audio and video	Text or program, image and Sound

→ Application	JPEG, GIF, MP3, MP4, GGG, H-264, MKV etc	RAW, BMP, PNG, WAV, FLAC, ALAC etc
→ Data holding capacity of the channel	More	Less as compared to lossy method
	→ lossy compression Removes non-useful part of the data	with lossless compression Reconstructs the exact data.
	→ lossy Compression can Decrease the size of the file to a greater extend.	lossless Compressin can Reduce the size of Data at low extent
	→ The quality of the data degraades in case of lossy Compressin	lossless doesn't Degrade the quality of the data.
	→ In the lossy technique, the channel accomedds more data	Conversely Channel holds a smaller amount of data in case of lossless techinque.