

MIIA 2018

1. What is the minimal unit for single character in digital?

- A) 1 bit
- B) 2 bits
- C) 1 bytes
- D) 2 bytes
- E) 1 word

2. Which is an order of SI unit size from large to small in capacity?

- A) Kilo → Mega → Giga → Tera
- B) Kilo → Mega → Tera → Giga
- C) Giga → Tera → Mega → Kilo
- D) Peta → Tera → Giga → Mega

3. Which of the following properly arrange the conception of information from minimum to maximum in size?

- A) Character (word) -> Record -> File -> Field
- B) File -> Record -> Field -> Character (word)
- C) Record -> Field -> File -> Character (word)
- D) Character (word) -> Item -> Record -> File
- E) Field -> Character (word) File -> Record ->

4. Which of the following is the volatile memory that need electricity for keeping data?

- A) RAM
- B) FDD
- C) ROM
- D) HDD
- E) CD

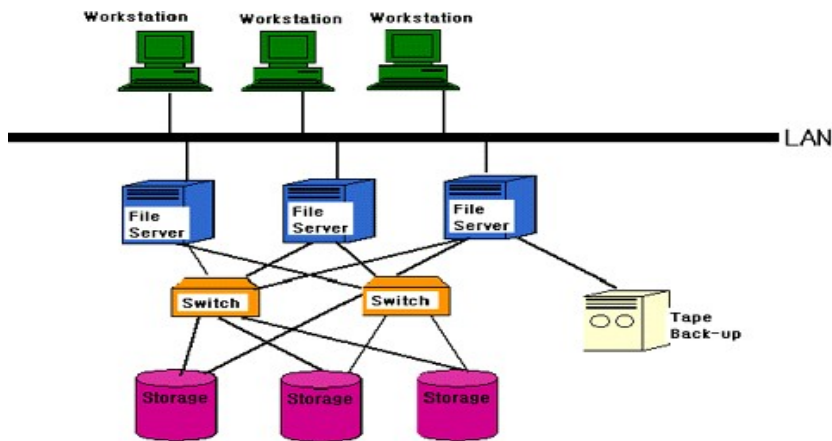
5. Which of the following is correct for explanation about Cache Memory?

- A) It is bigger capacity than RAM
- B) It is applicable to control tool of system
- C) It is applicable to assistant of memory tool
- D) It keeps a program or data which is the most frequently using in the computer
- E) The performance will fall off when it has bigger capacity

6. What is the technique to share Storage though Network?

- A) Acquisition
- B) Database
- C) SAN
- D) Backup
- E) Broker

7. Which of the following is correct explanation blow?



- A) SPS
- B) NAS
- C) SAN
- D) NFS
- E) SCU

8. What is mean the physical address in blow image?

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Ethernet adapter ?? ?? ??:
    Connection-specific DNS Suffix . . . . . : 
    Description . . . . . : Atheros AR8161/8165 PCI-E Gigabit Ethernet
    Physical Address. . . . . : 88-9E-81-97-5A-43
    Autoconfiguration Enabled . . . . . : Yes
    Link-local IPv6 Address . . . . . : fe80::e13d:7375:1208:7e2b%13(Preferred)
    Autoconfiguration IPv4 Address. . . . . : 169.254.126.43(Preferred)
    Subnet Mask . . . . . : 255.255.0.0
    Default Gateway . . . . . : 
    DHCPv6 IAID . . . . . : 285777489
    DHCPv6 Client DUID. . . . . : 88-81-88-81-22-99-96-B3-88-9E-81-97-5A-43

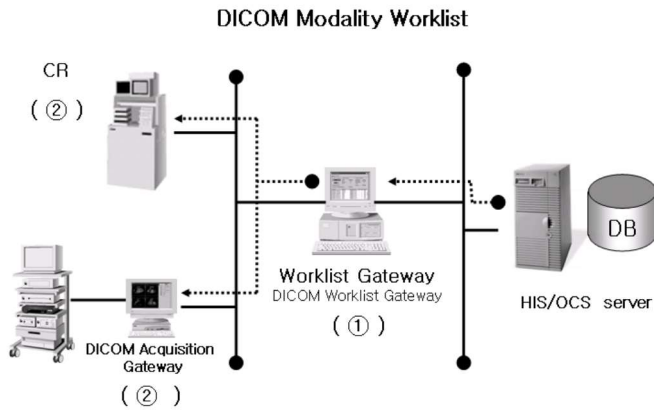
    DNS Servers . . . . . : fec8:0:0:ffff::1%1
    fec8:0:0:ffff::2%1
    fec8:0:0:ffff::3%1

    NetBIOS over Tcpip. . . . . : Enabled

unnel adapter isatap.{8E39B7C4-43D8-4278-9395-D6211B1888DB}:
    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix . . . . . : 
    Description . . . . . : Microsoft ISATAP Adapter
    Physical address. . . . . : 00-00-00-00-00-00-E0
    DHCP Enabled. . . . . : No
    Autoconfiguration Enabled . . . . . : Yes
    
```

- A) IP address
- B) Subnet mask
- C) MAC address
- D) Default gateway
- E) TCP/IPv4

9. This is DICOM Modality Worklist diagram. What is the most suitable for ① and ② ?



- A) ① DICOM Worklist SCP ② DICOM Worklist SCP
- B) ① DICOM Worklist SCU ② DICOM Worklist SCU
- C) ① DICOM Worklist SCP ② DICOM Worklist SCU
- D) ① DICOM Worklist SCU ② DICOM Worklist SCP
- E) ① DICOM Broker SCP ② DICOM Broker SCU

10. Which of the following DICOM tags is most likely used to store patient name?

- A) (0008,0008)
- B) (0010,0010)
- C) (0010,0030)
- D) (0010,1000)
- E) (0010,1300)

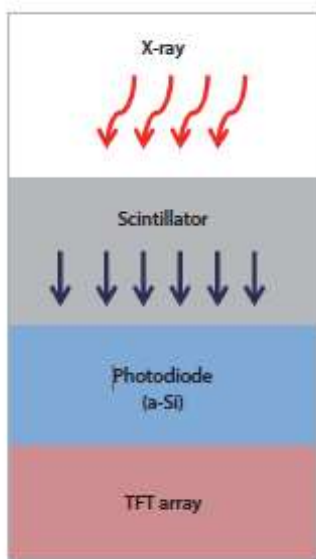
11. Which of the following is a proper term which is the standard for interchange text from the different equipment?

- A) IHE    B) HIS    C) HL7    D) DICOM    E) HIPPA

12. Which of the following is a correct flow of data in PACS?

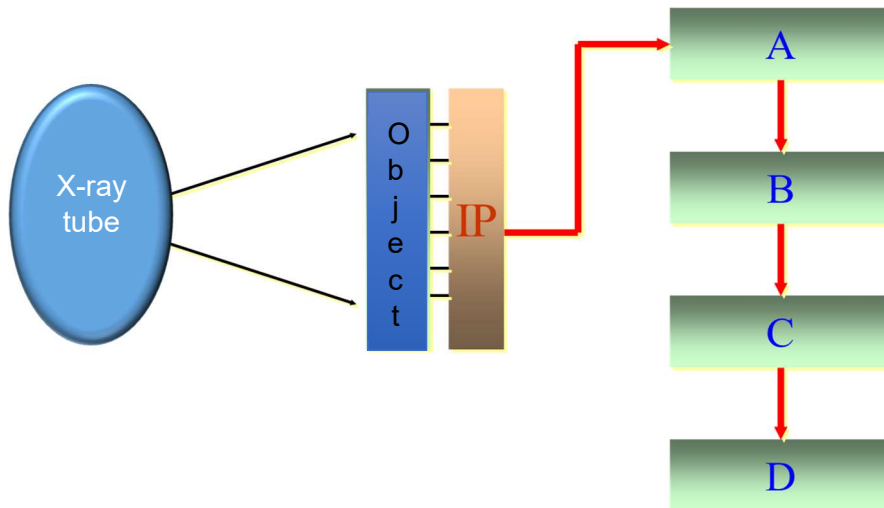
- (1) Modality    (2) Disk array (RAID)    (3) Server    (4) Backbone
- A) (1) → (2) → (3) → (4)
  - B) (1) → (3) → (2) → (4)
  - C) (1) → (4) → (3) → (2)
  - D) (1) → (3) → (4) → (2)
  - E) (3) → (1) → (4) → (2)

13. What is the equipment which is using this principal explaining by the image?



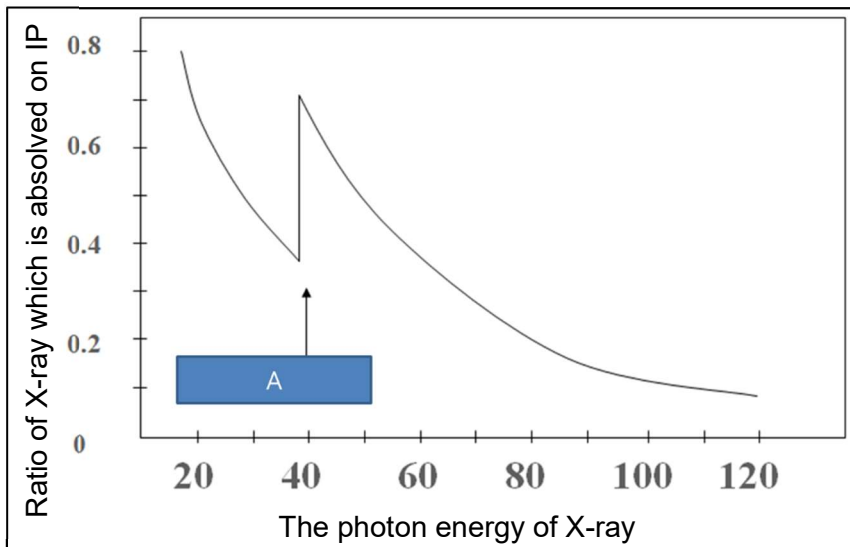
- A) CR
- B) BMD
- C) Direct DR
- D) Indirect DR
- E) CCD type DR

14. What is correct process of image management in CR system?



- A) Image reader – Image recorder - Image management – Image
- B) Image recorder – Image management – Image reader – Image
- C) Image management – Image recorder – Image reader – Image
- D) Image reader – Image management – Image recorder – Image
- E) Image recorder – Image reader – Image management – Image

15. What is the [A] as the X-ray absorptive Spectrum about IP or CR?



- A) K absorption edge of Br
- B) K absorption edge of Ba
- C) K absorption edge of I
- D) K absorption edge of Cl
- E) K absorption edge of Na

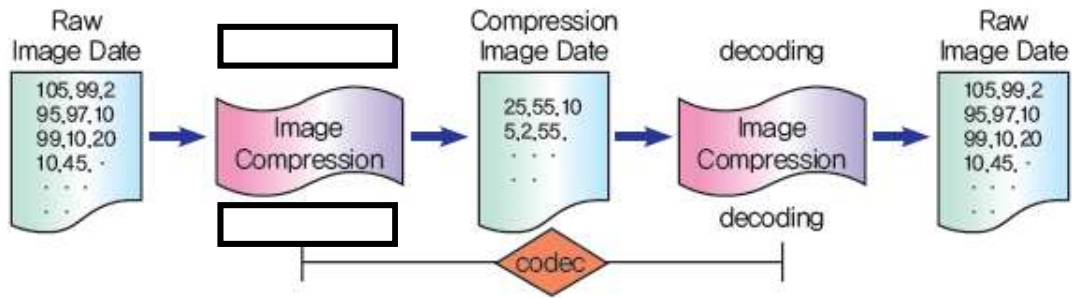
16. Which of the following is needed when transferring image from CT modality to PACS server?

- A) Query/Retrieve SCP
- B) Query/Retrieve SCU
- C) Storage SCP
- D) Storage SCU
- E) SOP Instans UID

17. Which of the following is the most related to keep CD as DICOM type?

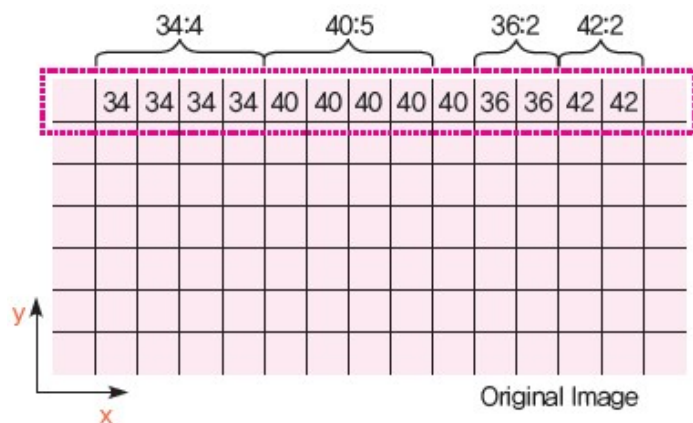
- A) HL7 layer
- B) DICOM DIR
- C) Modality SCU
- D) Modality SCP
- E) autorun function

18. What is the blank in the compression process of image?



- A) Decoding
- B) Encoding
- C) Format
- D) Transfer
- E) Elimination

19. Which of the following is the correct explanation of compression method of image?



- A) It is the lossless compression as the simplest method
- B) The effect get less when it has bigger
- C) The effect is far better in Radiology
- D) The block of repeated pixel express the repeat times of factor and that factor
- E) It is shown low compression ratio in images, cartoons and graphics made by computer.

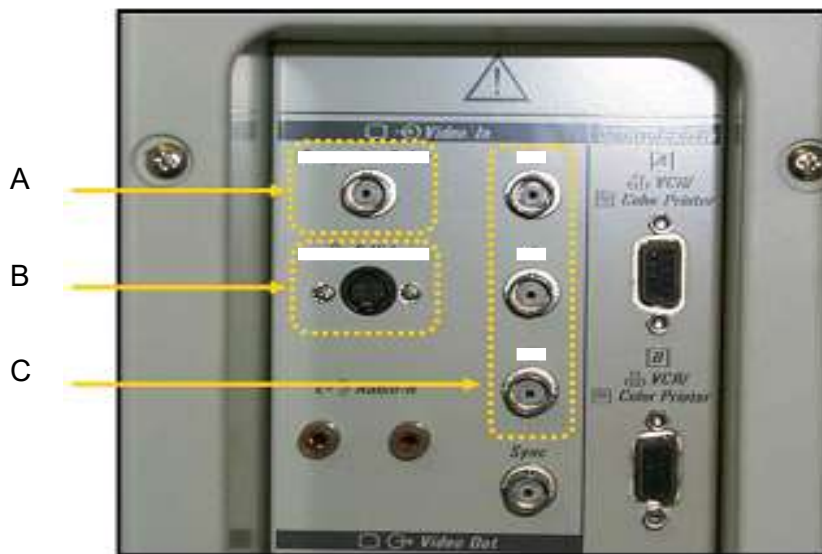
20. Which of the following is to be able to exchange between HIS and PACS?

- A) ACQ Server
- B) DB Server
- C) Gateway
- D) Broker
- E) HUB

21. Which of the following is a proper term of software which handle the received data from image equipment, and re-send or keep?

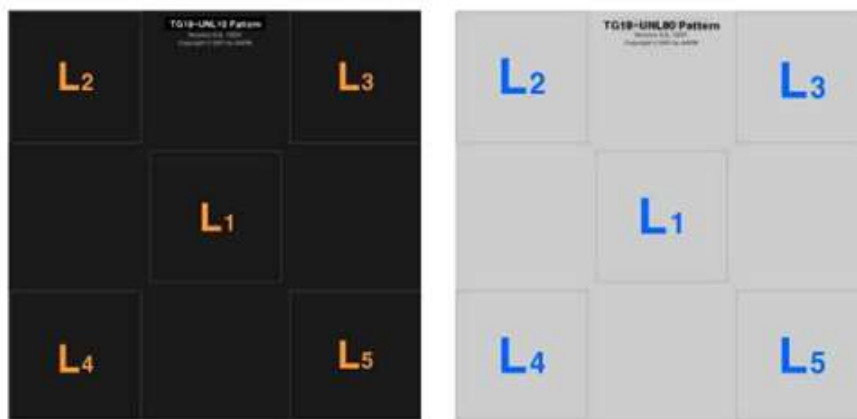
- A) Hub
- B) Server**
- C) Gateway
- D) Backbone
- E) Router

22. What is the correct combination?



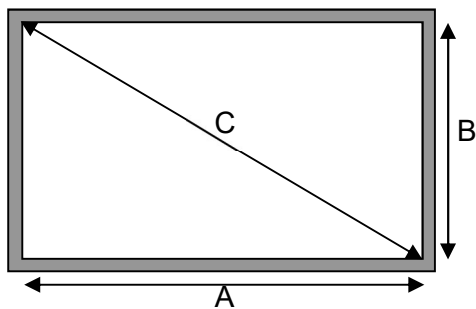
- A) A – Composite, B - RGB, C - Super VHS
- B) A – Super VHS, B - Composite, C - RGB
- C) A – RGB, B - Super VHS, C - Composite
- D) A – Super VHS, B - RGB, C - Composite
- E) A – Composite, B - Super VHS, C – RGB

23. Which of the following is acquired from this image measuring L1 to L5?



- A) Uniformity of luminescence
- B) Cumulative time of use
- C) Geometrical distortion
- D) Bit resolution changes
- E) Resolution

24. Which of the following is representing the monitor size?



- A) Length of A
- B) Length of B
- C) Length of C
- D) Length of A + B
- E) Length of B + C



25. What standard guideline is used for the medical image performance evaluation in AAPM (American Association of Physicists in Medicine)?

- A) AAPM Task Group 16
- B) AAPM Task Group 17
- C) AAPM Task Group 18
- D) AAPM Task Group 19
- E) AAPM Task Group 20

26. Which of the following is NOT a type of carrying CD copy for patient Image data?

- A) It should be confirmed real patient information
- B) It makes Image as No compression conditions
- C) It doesn't matter to do burning independently of compression
- D) It must be confirmed identify a patient
- E) It should be confirmed to be possible copy for data capacity

27. Which of the following is the evidence data to chase the adapter or deletion of image data?

- A) IP Security
- B) DICOM Header
- C) Configuration Data
- D) Access Log
- E) Configuration file

28. As located between internet and intranet, Which system protects a network from unjust accesses?

- A) Modem
- B) Intranet
- C) Firewall
- D) Backbone
- E) Wi-Fi

29. When a server have a problem in the middle of conduct of a work in a 2 servers and over, other server cover the problem. What is this technique?

- A) SAN
- B) DAS
- C) NAS
- D) Clustering
- E) UPS

30. Which of the following is the correct for division each equipment in PACS

- A) AE Title
- B) Study UID
- C) Station Name
- D) SOP instance UID
- E) IP Address

31. It is the native factor as the standard of matching for patient order and image information, also can be maximum is 16. What is that?

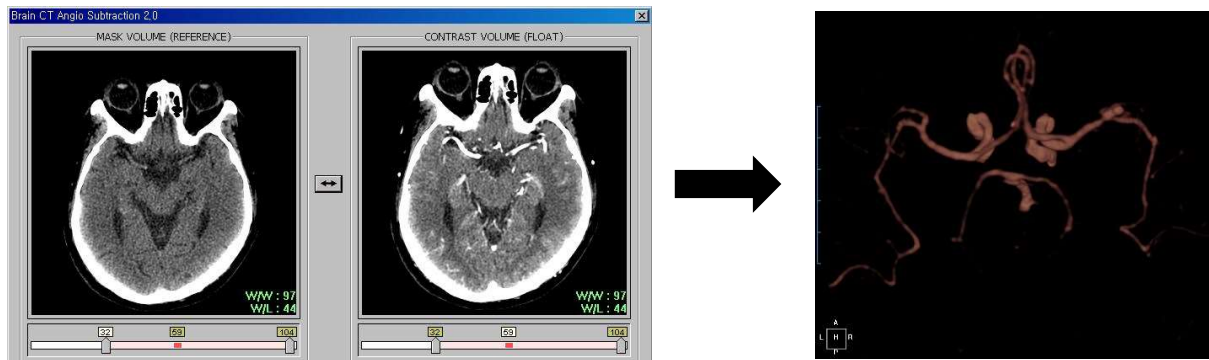
- A) SOP Class
- B) Study Number
- C) Series Number
- D) Accession Number
- E) Study UID

32. What is this 3-dimentional images processing technique called?



- A) Virtual Endoscopy
- B) Shaded Surface Display
- C) Multi Planner Reformat
- D) Volume Rendering Technique
- E) Maximum Intensity Projection

33. Which of the following is the correct explanation blow image?



- A) The MRA image which is reconstructed image by using to check rate of blood flow
- B) Cerebral vascular image by using the 3-dimentional image in Intervention
- C) CT image of cerebral vascular which made by subtraction Pre & Post contrast CT scan
- D) Cerebral vascular image by using doppler
- E) CT image of cerebral vascular which made by a false endoscopy

34. What is the process which make continuous signal to discontinuous signal?

- A) Sampling
- B) Quantization
- C) Scanning
- D) Compression
- E) Reconstruction

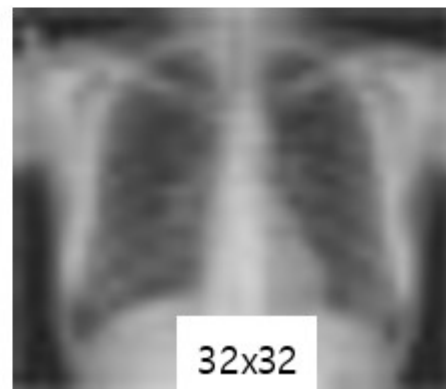
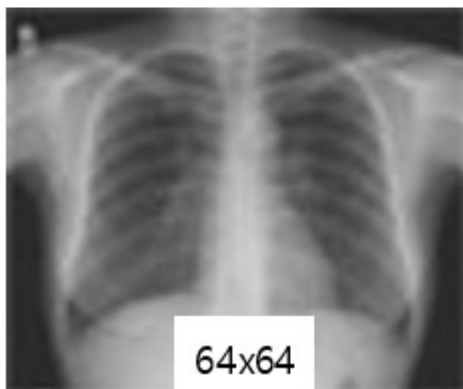
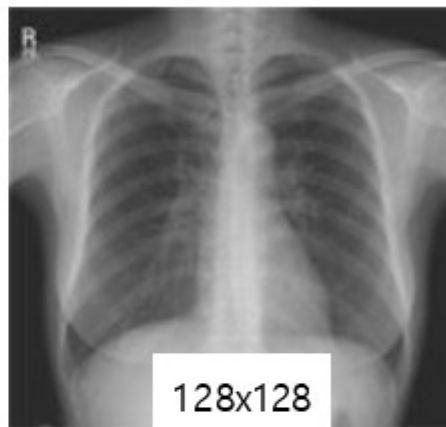
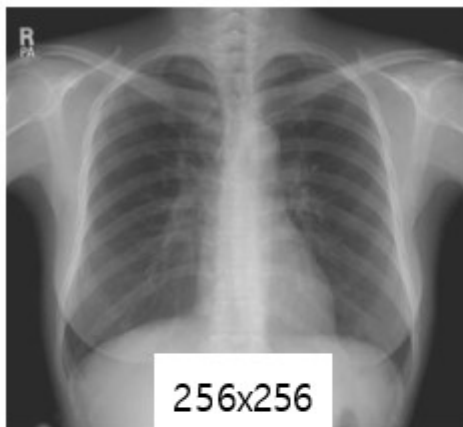
35. What does spatial resolution of 5 lp(line pairs)/mm?

- A) Black 5 lines in 1mm
- B) White 5 lines in 1mm
- C) Black 2.5 lines and White 2.5 lines in 1mm
- D) Black 5 lines and White 5 lines in 1mm
- E) Black 1 lines and White 1 lines in 5mm

36. Which of the following is related with Modulation Transfer Function(MTF) in high frequency?

- A) Contrast resolution
- B) Image noise
- C) Image linearity
- D) Image uniformity
- E) Spatial resolution

37. Which of the following is most likely TRUE?



- A) The change of intensity
- B) The change of sampling
- C) The change of quantization
- D) The change of coding
- E) The change of frequency

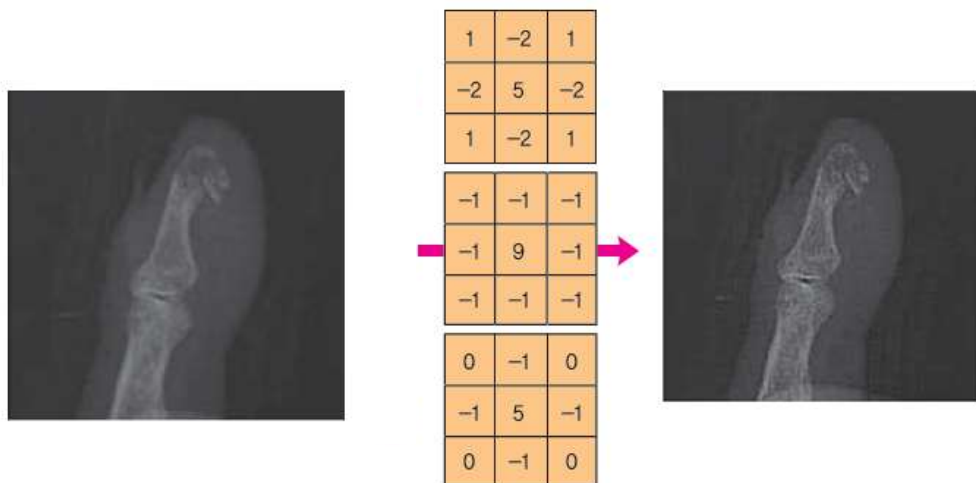
38. Which of the following is correct for explanation of Beam hardening?

- A) It occur by partial volume effect
- B) It is able to corrected by using Adaptive Filter
- C) It is the artifact from mono-spectrum radiation
- D) It transfer the spread of Energy to lower because lower-Energy X-ray is more absorbed
- E) It is the actual state that is decrease CT number according to closed part of bone and tissue in palatine of skull.

39. Which of the following is the most suitable method to check image quality for contrast and noise?

- A) DQE (Detective Quantum Efficiency)
- B) MTF (Modulation Transfer Function)
- C) Resolution
- D) Capture Graphic Card
- E) SNR (Signal to Noise Ratio)

40. It makes the image of space clearly when it is in rather cloudy, but over-stressing high frequency also can increase the noise. What is this method?

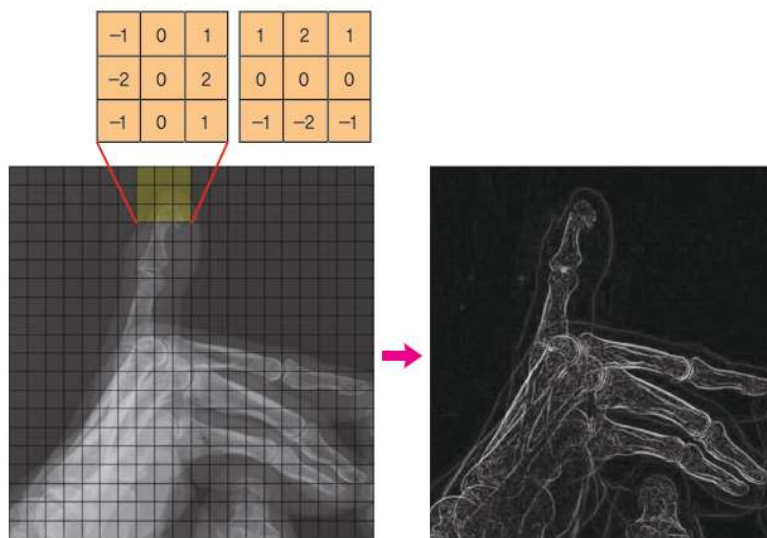


- A) Low Pass Filter
- B) High Pass Filter
- C) Edge Detection Filter
- D) Arithmetic operation
- E) Windowing

41. What is the minimal unit for digital image?

- A) Pixel
- B) Voxel
- C) Matrix
- D) Record
- E) File

42. What is this method in Edge Detection Filter ?



- A) Prewitt filter
- B) Robert filter
- C) Sobel filter
- D) Frei-Chen filter
- E) Low Pass filter

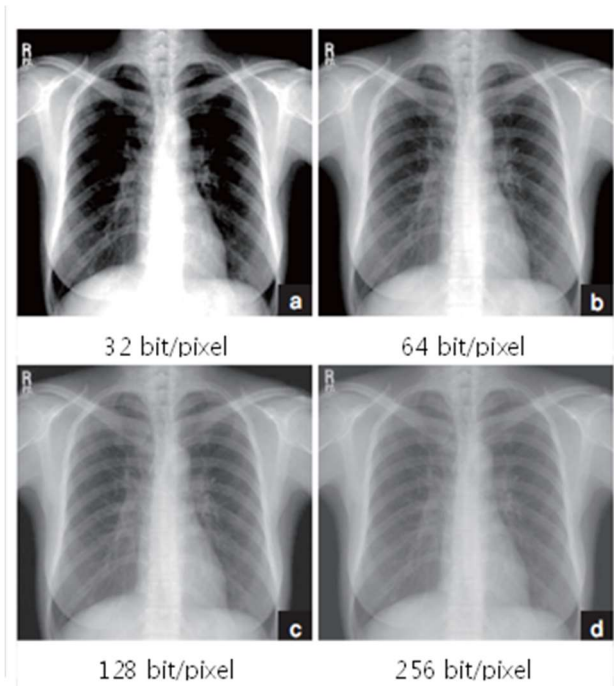
43. What is the process which makes continuous to discontinuous signal?

- A) Sampling
- B) Post-processing
- C) Pre-processing
- D) Quantization
- E) Marking

44. Which of the following is to express altogether Image compression and restoration hardware ?

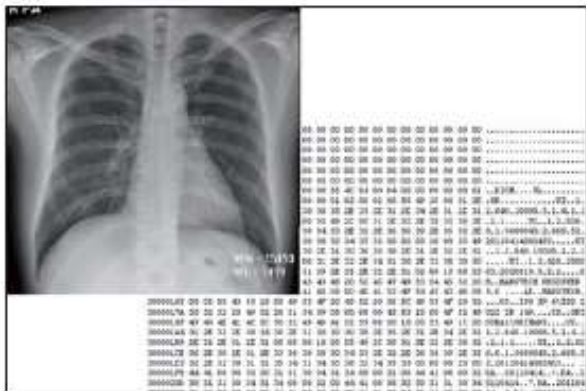
- A) Codec
- B) Endecoding
- C) Decoder
- D) Encoder
- E) Compressor

45. Which of the following is most likely TRUE?



- A) The change of intensity
- B) The change of sampling
- C) The change of quantization
- D) The change of coding
- E) The change of compression method

46. Which of the following is a proper type of pixel



- A) 1-dimentonal image
- B) 2-dimentonal image
- C) 3-dimentonal image
- D) 4-dimentonal image
- E) 5-dimentonal image

47. What is the compression technique suitable for showing better high resolution image when DICOM image is compressed?

- A) JPEG 2000
- B) Huffman coding
- C) G3/G4 compression
- D) Run-Length compression
- E) MPEG

48. What is the correct artifact which is occurred by discordance of Nyquist frequency between grid and detector?



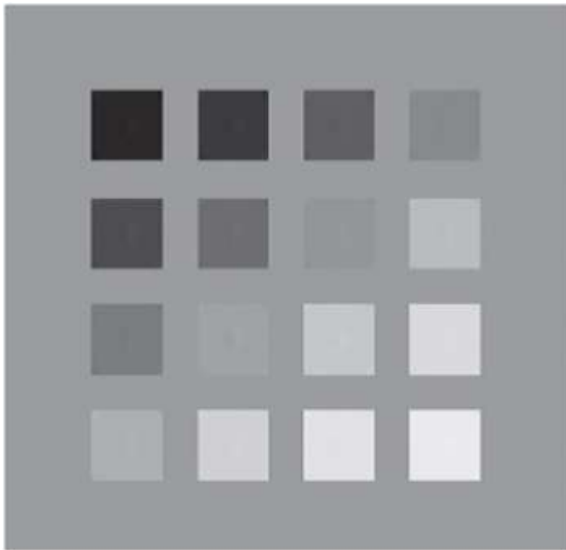
- A) Moving artifact
- B) Mirror artifact
- C) Cutoff artifact
- D) Heel artifact
- E) Moire artifact

49. What is the tool frequently using for DICOM monitor testing?

- A) AAPM Task Group 18 Test Patterns
- B) MoPH Task Group 99 Test Patterns
- C) SEMTE18 Test Patterns
- D) DICOM MHGS 18 Test Patterns
- E) ACR Test Patterns

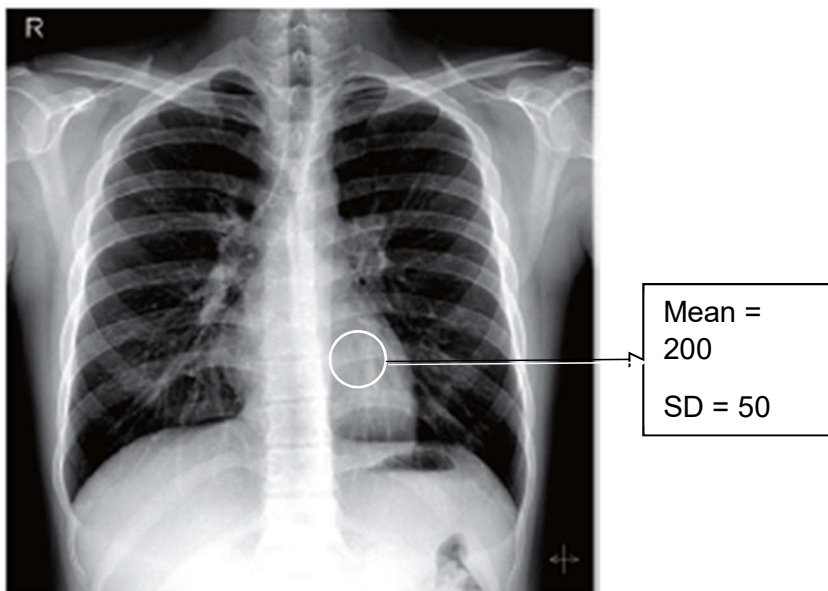


50. What is the name of the test pattern shown below?



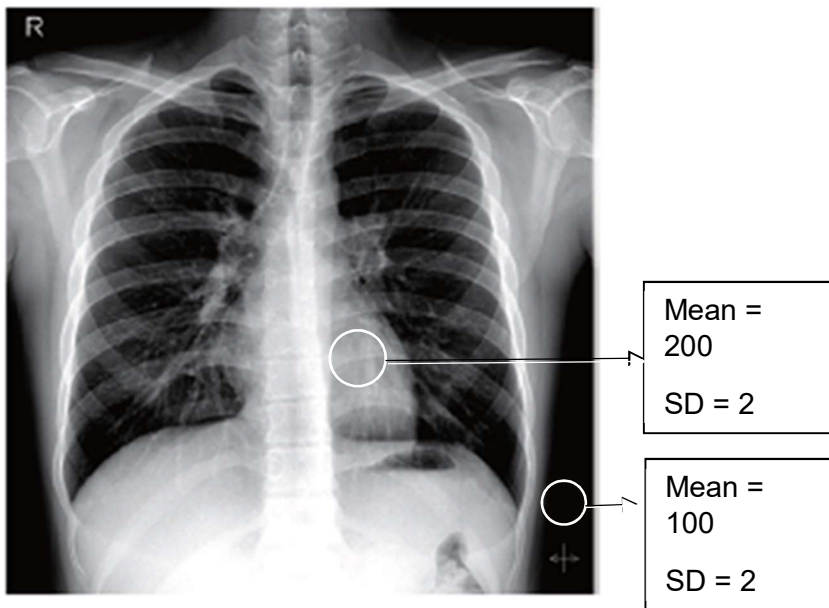
- A) TG18-LN
- B) TG18-CT
- C) TG18-BN
- D) TG18-CX
- E) TG18-AD

51. What is the correct SNR shown below?



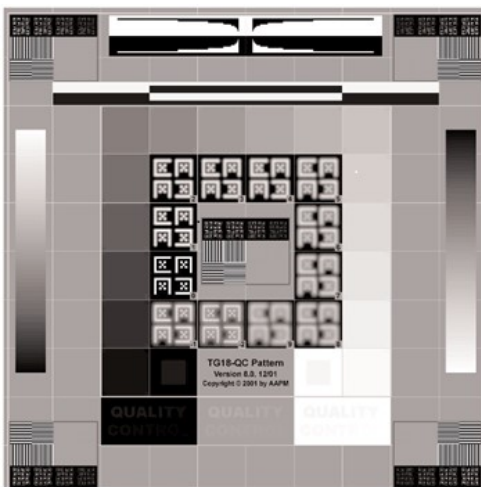
- A) 2
- B) 4
- C) 500
- D) 1000
- E) 2000

52. What is the correct CNR shown below?



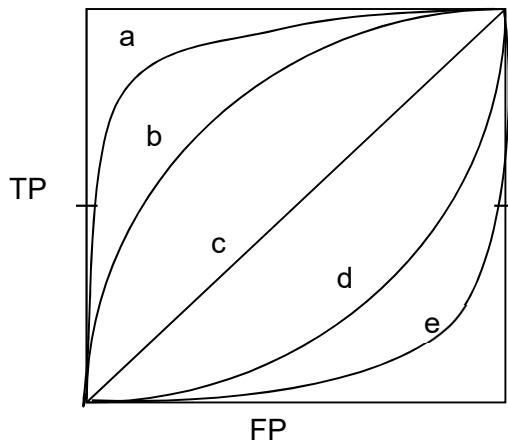
- A) 4      B) 20      C) 50      D) 100      E) 200

53. What is the correct valuation point in pattern shown below?



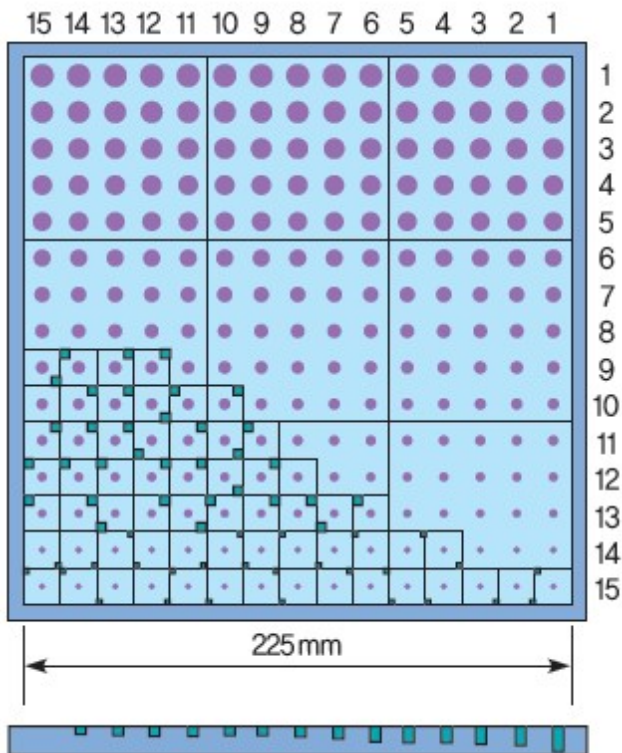
- A) Black brightness  
B) White brightness  
C) Brightness reaction  
D) Geometric distortion  
E) Noise

54. Which of the following ROC curves is the largest in sensitivity and peculiarity?



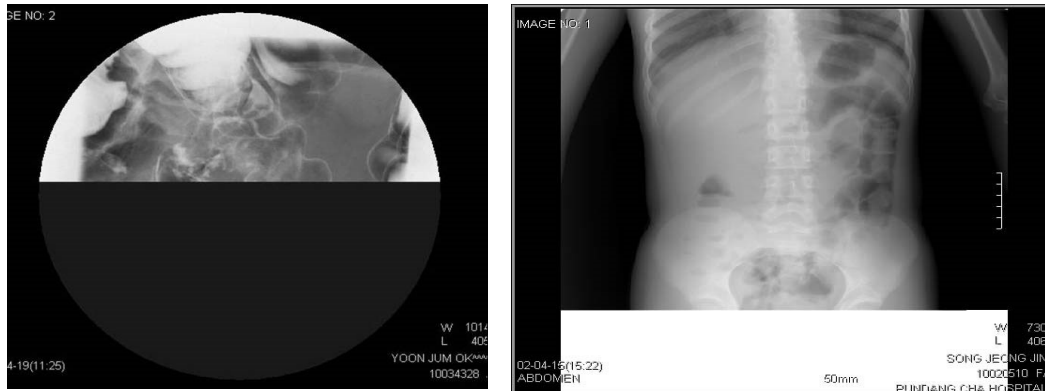
- A) a
- B) b
- C) c
- D) d
- E) e

55. Which of following is the most likely technique blow phantom?



- A) ROC (Receiver – Operation Characteristic)
- B) Landol chart
- C) Hawlet chart
- D) Burger’s phantom
- E) SMPTE pattern

56. What makes this error in blow image?



- A) Compression error
- B) CR reader error
- C) IP change error
- D) Network error
- E) Storage error

57. What is the process which make continuous signal to discontinuous signal?

- A) Pre-processing
- B) Post-processing
- C) Quantization
- D) Sampling
- E) Resampling

58. After intensity dispersion of original data is distributed over whole part of the system, what makes frequency of visible density uniform?

- A) Interpolation
- B) Threshold technique
- C) Histogram Equalization
- D) Unsharp mask subtraction

59. Which of the following is NOT correct about HL7?

- A) It is a transmission standard in medical information field which is used in the world most widely.
- B) It is a only international standard for exchanging information among medical information systems.
- C) It is a open standard which is developed by information developer, etc together.
- D) Firstly in RSNA(Radiological Society of North America) conference, a regulation of message transmission that network should be connected among devices having different types of image information was made

60. Which of the following is NOT correct about PACS data?

- A) Most of image information is stored as file type.
- B) PACS data is divided into DICOM image and database information.
- C) Database Information is larger than DICOM image.
- D) Database information contains organized index value, patient information, examine information of DICOM image.

61. Which of the following is the most related when storing the DICOM image in CD?

- A) HL7 layer
- B) DICOM DIR
- C) Modality SCU
- D) Modality SCP

62. What is DICOM basic unit?

- A) DIMSE(DIcom Message Service Element)
- B) SCU(Service Class User)
- C) SOP(Service Object Pair)
- D) IOD(Information Object Definition)

63. What is TAG for checking whether files are compressed or not and knowing the method?

- A) File meta information version (0002, 0001)
- B) Media storage SOP class UID (0002, 0002)
- C) Transfer syntax UID (0002, 0010)
- D) SOP instance UID (0008, 0018)

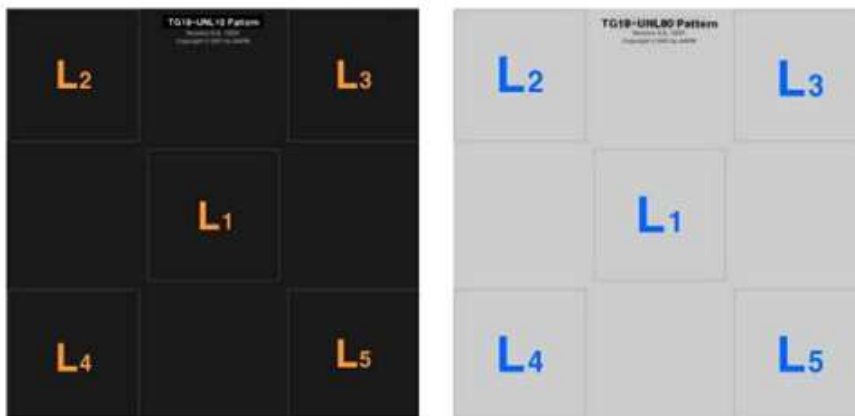
64. Which of the following is NOT DICOM Message Service Element(DIMSE)?

- A) C-store
- B) C-get
- C) N-store
- D) N-get
- E) E-Move

65. Which of the following is NOT acquired from DICOM Header?

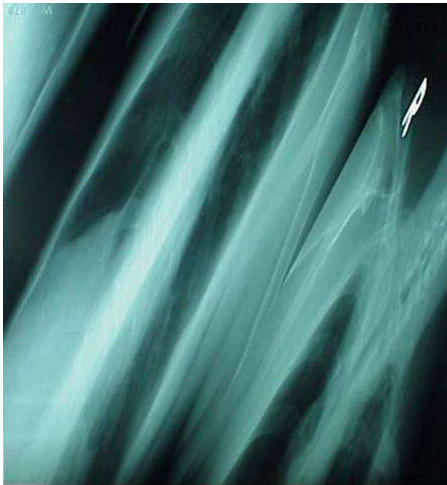
- A) Patient name
- B) Date of birth
- C) IP Address
- D) Modality
- E) UID

66. Which of the following is acquired from this image measuring L1 to L5?



- A) Uniformity of luminescence
- B) Cumulative time of use
- C) Geometrical distortion
- D) Bit resolution changes
- E) Location distortion

67. What is the cause of the error in this image?



- A) CR Error
- B) IP Scratch Error
- C) Compression Error
- D) DB Connect Error
- E) Bit collapse

68. Where is the best body part for applying High-pass filter?

- A) Bone and lung
- B) Cartilage and muscle
- C) White and gray matter
- D) Muscle and fat
- E) Cartilage and fat

69. What is the element to convert X-ray to electric signal directly?

- A) a-Si
- B) a-Se
- C) CsI(Cesium Iodide)
- D) Gallium Arsenide
- E) Cesium Arsenide

70. Which of the following is NOT the photostimulable phosphor of Image Plate?

- A) BaFCl : Eu<sup>2+</sup>
- B) BaFBr : Eu<sup>2+</sup>
- C) BaFI : Eu<sup>2+</sup>
- D) BaFAg : Eu<sup>2+</sup>

E) BaNCI : Eu<sup>2+</sup>

71. What best explain the cause of the artifact (arrow) in the image below?



- A) IP cracked
- B) Dirt or other foreign matter
- C) Incomplete erasure
- D) IP Reading error
- E) Laser scanner error

72. Which of the following describes the distance between two dots in display monitor?

- A) Contrast ratio
- B) Brightness
- C) Dot pitch
- D) Pixel size
- E) Bit depth



73. Which of the following item is required for the server when receiving an image from a modality?

- A) Storage SCU
- B) Storage SCP
- C) Query/Retrieve SCU
- D) Query/Retrieve SCP
- E) C-Find

74. What is the best technique should be applied for the PACS server to provide 24/7 service in the Radiology Department?

- A) Load balance clustering
- B) High availability clustering
- C) Storage Area Network
- D) Network Attached Storage
- E) Direct Attached Storage

75. Which item provides fastest data read/write with an advantage of data loss prevention?

- A) RAID 0
- B) RAID 1
- C) RAID 3
- D) RAID 5
- E) RAID 6

76. What command in Windows give the result simila to the provided picture below?

```
Pinging 10.4.2.200 with 32 bytes of data:
Reply from 10.4.2.200: bytes=32 time<1ms TTL=255
Reply from 10.4.2.200: bytes=32 time<1ms TTL=255
Reply from 10.4.2.200: bytes=32 time<1ms TTL=255
Reply from 10.4.2.200: bytes=32 time<1ms TTL=255
Reply from 10.4.2.200: bytes=32 time<1ms TTL=255
Reply from 10.4.2.200: bytes=32 time<1ms TTL=255
Reply from 10.4.2.200: bytes=32 time=4ms TTL=255

Ping statistics for 10.4.2.200:
    Packets: Sent = 7, Received = 7, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 4ms, Average = 0ms
Control-C
^C
C:\Users\usera>
```

- A) Ping 10.4.2.200 -l 255
- B) Ping 10.4.2.200 -t
- C) Ping 10.4.2.200 -f
- D) Ping 10.4.2.200 -l 32
- E) Ping 10.4.2.200

77. What command in Windows give the result simila to the provided picture below?

```
Pinging 10.4.2.200 with 32 bytes of data:  
Reply from 10.4.2.200: bytes=32 time=1ms TTL=255  
Reply from 10.4.2.200: bytes=32 time<1ms TTL=255  
Reply from 10.4.2.200: bytes=32 time=2ms TTL=255  
Reply from 10.4.2.200: bytes=32 time=1ms TTL=255  
  
Ping statistics for 10.4.2.200:  
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),  
    Approximate round trip times in milli-seconds:  
        Minimum = 0ms, Maximum = 2ms, Average = 1ms  
  
C:\Users\usera>
```

- A) Ping 10.4.2.200 -l 255
- B) Ping 10.4.2.200 -t
- C) Ping 10.4.2.200 -f
- D) Ping 10.4.2.200 -t 32
- E) Ping 10.4.2.200

78.what is the resolution of 3MP diagnostic monitor?

- A) 768 x 4096
- B) 1600 x 1966
- C) 1200 x 2621
- D) 1966 x 2621
- E) 2048 x 1536

79.which of the following item is correct?

- A)  $1 \text{ XOR } 1 = 1$
- B)  $1 \text{ XOR } 0 = 0$
- C)  $0 \text{ XOR } 0 = 1$
- D)  $1 \text{ XOR } 0 = 1$
- E)  $1 \text{ XOR } 1 = 0$

80. What item is an explanation of the process shown in the image below?



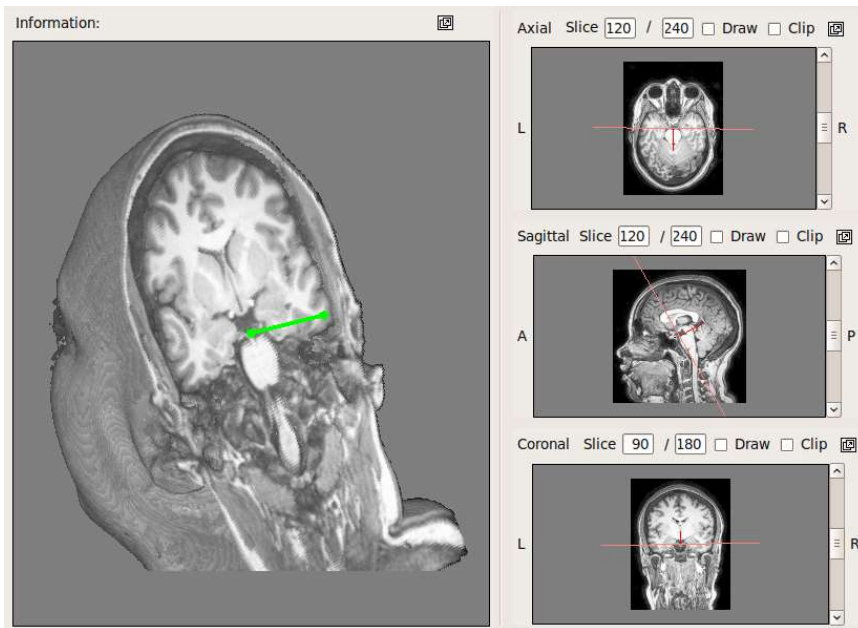
- A) Distortion calibration
- B) Gray scale checking
- C) Monitor contrast checking
- D) Luminance calibration
- E) Ambient light checking

81. What is the image processing technique used in the image below?



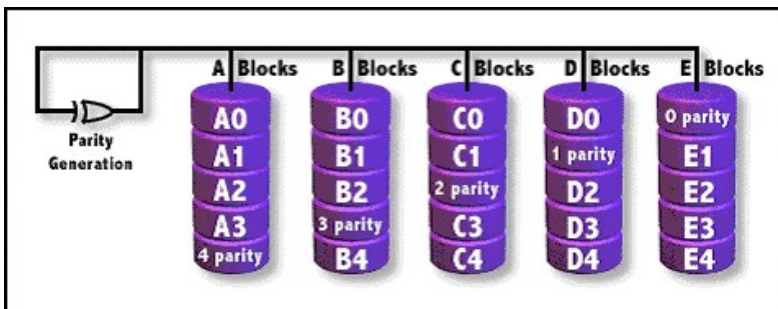
- A) VRT (Volume rendering technique)
- B) SSD (Shaded surface display)
- C) MPR (Multiplanar reformation)
- D) Virtual endoscopy
- E) 3D Image reconstruction

82. What following item is best described the image below?



- A) Volume rendering
- B) Feature Extraction Technique
- C) Multiplanar reformation
- D) Virtual Reality
- E) Volume rendering technique

83. What is this diagram showing?



- A) RAID 0
- B) RAID 1
- C) RAID 3
- D) RAID 5
- E) RAID 6

84. Which is the following is the most related to spatial resolution in medical image quality evaluation?

- A) NPS

- B) DQE
- C) ROC
- D) MTF
- E) SNR

85. What is the unit of brightness of reading monitor?

- A)  $\text{lm}/\text{m}^2$
- B)  $\text{lx}/\text{m}^2$
- C)  $\text{cd}/\text{m}^2$
- D)  $\text{pm}/\text{m}^2$
- E)  $\text{Gx}/\text{m}^2$

86. What header information is described in following *table*?

(0008,0005)	CS	10	Specific Character Set	ISO_IR 100
(0008,0016)	UI	26	SOP Class UID	1.2.840.10008.5.1.4.1.
(0008,0018)	UI	46	SOP Instance UID	1.3.12.2.1107.5.4.4.01.
(0008,0020)	DA	8	Study Date	20050707
(0008,0021)	DA	8	Series Date	20050707
(0008,0022)	DA	8	Acquisition Date	20050707
(0008,0023)	DA	8	Content Date	20050707
(0008,0030)	TM	6	Study Time	235839
(0008,0031)	TM	14	Series Time	235839.515000
(0008,0032)	TM	6	Acquisition Time	235839
(0008,0033)	TM	6	Content Time	235839
(0008,0050)	SH	8	Accession Number	80255812
(0008,0060)	CS	2	Modality	CR

- A) RIS
- B) HL7
- C) IHE
- D) SOP
- E) DICOM

87. What is the cause of the following artifact image?

ข้อใดต่อไปนี้เป็นสาเหตุของ artifact ดังภาพ

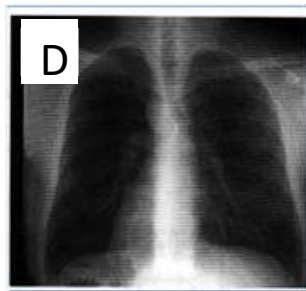
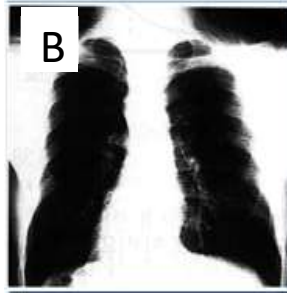
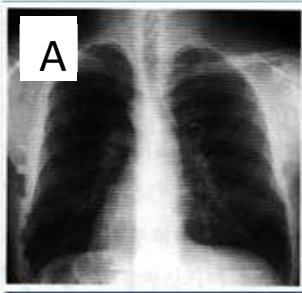
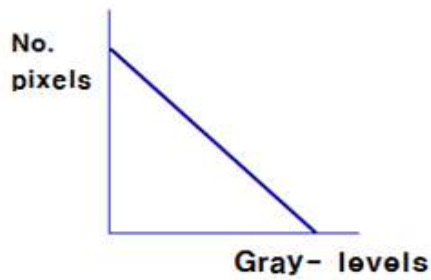


- A) Anode-Heel Effect.
- B) Clearing with alcohol.
- C) Defective plate
- D) Overexpose.
- E) Underexpose.

88. How many steps in grayscale that can be representing using 12 bits pixel depth?

- A) 256
- B) 512
- C) 1024
- D) 2048
- E) 4096

89. Which image is predictable when set by following Look Up Graph?



- A) A.
- B) B.
- C) C.
- D) D
- E) None of above

90. Which of the following is CORRECT when the quantization bit rate is changed from 9 bit to 8 bit?

- A) The volume of image data decreases to 75%
- B) The volume of image data decreases to 50%
- C) The volume of image data decreases to 25%
- D) The volume of image data decreases to 15%
- E) The volume of image data decreases to 5%

-----END OF EXAM-----