

PART ONE: PICTURE ARCHIVING AND COMMUNICATION SYSTEMS

1. _____ describes a situation in the imaging department where images are produced, analyzed, distributed, and stored in electronic form.
A DICOM B RAM C PACS D HMO
2. General radiography probably accounts for _____ % of diagnostic imaging workloads.
A 70 B 90 C 50 D 38
3. The best configuration for a PACS network is to be physically _____ (typically by means of switches) the hospital backbone.
A dominant over B integrated in C partially integrated in D isolated from
4. Images/exams are sent to the PACS image server, where they will be stored on the system RAID (_____ array of independent discs).
A redundant B rapid C ready D radiological
5. DICOM (Digital Imaging and Communications in Medicine) links an information object with a service class to create a SOP (_____).
A simple-object pair B service-object pair C service-operation pair D service-object pipe

PART TWO: NUCLEAR MEDICINE IMAGING TECHNOLOGY

6. Approximately _____ % diagnostic nuclear medicine imaging procedures are performed in the United States each year.
A 5 B 11 C 16 D 22
7. Scintillation camera technology accounts for more than _____ % of the imaging procedures performed in nuclear medicine.
A 70 B 82 C 88 D 95
8. The majority of SPECT systems used in nuclear medicine typically employ _____ detectors.
A 1-3 B 5-6 C 7 D 10

PART THREE: COMPUTED TOMOGRAPHY: TECHNOLOGY UPDATE...

9. Helical CT scanners have no inertial limitations during the scan cycle since both the gantry and table move _____ during the scan.
A in 'stop-n-go' fashion B at constant velocity C with acceleration D with deceleration
10. The collimated slice thickness is _____ than the dimensions of an individual detector in multiple detector array systems.
A always smaller B usually greater C always greater D usually smaller
11. As part of acceptance testing a new scanner, the computed tomography _____ index (CTDI) should be measured.
A disc B deployment C dose D detector
12. CTDI values are often computed in plastic, and it is *not* important for any reason to compute the tissue (or water equivalent) dose.
A True B False
13. The author describes a robust method of assigning studies to particular radiologists with applied computer parameters, referred to as the:
A Bowman logic approach B Baugh logic approach C Beam logic approach D Boolean logic approach
14. The CT scanner console can act as either a service class user (SCU) or a service class _____ (SCP), depending on the function.
A provider B parameter C part D portal

PART FOUR: MAGNETIC RESONANCE IMAGING AND PACS

15. According to the text, MRI is an evolving technology capable of acquiring large numbers of images (_____) in a single examination.
A >20 B >100 C >500 D >1000
16. "_____ space" is a term for the raw data space that will be transformed to yield the MR image.
A r- B x- C k- D z-
17. MR and CT are capable of acquiring _____ data – image data where the scale of the pixel dimensions are equal in all three planes.
A lipotropic B xenotropic C isotropic D hydrotropic
18. The TOF technique works best for relatively rapid flow that is _____ to the slices in the imaging volume.
A parallel B perpendicular C at 45 degrees D at 25 degrees
19. Interventional MRI (iMRI) systems typically use _____ field magnets versus conventional systems.
A slightly higher B similar C significantly D lower

PART FIVE: DIGITAL ANGIOGRAPHY AND FLUOROSCOPY

20. The image intensifier was developed in the _____ to electro-optically increase the available light level during fluoroscopy.
A 1940s B 1950s C 1960s D 1970s
21. The contrast _____ is a measure of the ability of an image intensifier to produce contrast in the image of a radio-opaque object.
A index B marker C ratio D formula
22. Video camera characteristics that affect fluoroscopic imaging include all the following except:
A lag B dynamic range C spatial distortion D pitch

PART SIX: FILM DIGITIZERS AND LASER PRINTERS

23. Film digitizers convert the continuous optical density (OD) variations on analog film into a(n) _____ image.
A digital B latent C inverted D 'jpg file'
24. _____ response refers to the ability of the digitizer to accurately render the optical density variations.
A image B contrast C spatial D photon
25. Veiling glare is a low frequency degradation affecting the _____ areas in the digitized image.
A colored B light C dark D peripheral
26. Daily film digitizer QC involves digitizing a calibrated step wedge that spans an OD range of at least 0.1 to:
A 1.0 B 2.0 C 3.0 D 4.0
27. Pixel _____ is the center-to-center spacing of the pixel areas on the film.
A loudness B variance C pitch D matrix
28. _____ processing is a dry laser technology that was introduced by Polaroid Medical Imaging Systems in 1993.
A Microcapsule B Silver emulsion thermal C Convex D Adherographic

PART SEVEN: COMPUTED RADIOGRAPHY OVERVIEW

29. Computed Radiography (CR) refers to projection xray imaging using photostimulable or _____ phosphors.
A storage B container C cup D canteen
30. The spatial resolution response or sharpness of an image capture process can be expressed in terms of its _____ transfer function (MTF).
A modulation B middle C movement D minus
31. Regarding CR noise, the dose-dependent noise components can be classified into xray quantum noise, or _____, and light photon noise.
A muddle B mottle C haze D fog
32. Spatial frequency processing, sometimes called _____ enhancement, is an important part of CR image processing.
A edge B sharp C filter D line
33. Multiscale image contrast _____ (MUSICA) is a very flexible advanced image processing algorithm.
A amperes B altitude C algorithm D amplification

PART EIGHT: COMPUTED RADIOGRAPHY: QA/QC

34. Collimation and light-field convergence are _____ critical to CR image quality versus SF (standard film) image quality.
A slightly less B more C equally D very much less
35. Regarding correcting suboptimal images in CR, increasing mAs improves only:
A density B contrast C noise D gray-scale length
36. An problem in early CR cassettes was the _____ artifact, which was the image of a clip on the back of the imaging cassette.
A clippy B spaceship C vase D tombstone
37. The first phase of AT (_____ testing) is to conduct a component inventory and inspection.
A acceptance B adequate C accrual D ampere

PART NINE: DIGITAL MAMMOGRAPHY

38. Mortality from breast cancer can be reduced if the cancer is detected in situ (within the ductal system).
A True B False
39. There is an increased radiation dose (by a factor of _____) to the patient when using a radiographic grid compared with not using grid.
A 4-5 B 6 C 2-3 D 7

40. Digital detectors can be of two general types, _____ sensors or replaceable cassettes.
 A carry-over B captive C photon D LED
41. The sampling theorem states that only spatial frequencies in a special pattern (the _____ frequency) can be faithfully imaged.
 A Nyquist B Neville C Nordic D Nerlander
42. Digital Mammography requires _____, i.e., a constant sensitivity over the entire area of the image.
 A contrast B resolution C density D uniformity
43. Probably the most widespread detectors for digital radiography to date have been _____ phosphors, also known as storage phosphors.
 A light-sensing B photostimulable C electro-beam D zaplight
44. Scatter can be reduced either by using a narrow beam scanned acquisition technique or, in the case of an area detector, using a:
 A grid B filter C kVp increase D step wedge
45. In many cases, even state-of-the-art CRT monitors are not able to display a full digital mammogram at more than 1/2 its spatial resolution.
 A True B False
46. Digital imaging allows for image data manipulation. This advantage is apparent in _____ (a refinement of blurring tomography).
 A teletomography B dual energy tomography C tomosynthesis D image cohesion
47. The _____ is the signal-to-noise ratio of the output image.
 A effective resolution B noise equivalent quanta C detective quantum efficiency D dynamic range

PART TEN: IMAGE QUALITY AND DOSE

48. With digital technologies, the operator has less control over the radiographic parameters of kVp and mAs versus film based technologies.
 A True B False
49. _____ is a measure of the relative brightness difference between two locations in an image.
 A density B spatial resolution C aspect ratio D contrast
50. Image _____ may be defined as random variations in image signals.
 A contrast B noise C density D range
51. Xray interactions in a radiographic screen produce a small flash of light that consists of a large number of quanta (typically _____).
 A 50-100 B 150-250 C 300-400 D 500-1000
52. Units of the NPS (noise-power _____) depend on the physical basis of the image signal.
 A spectrum B server C solenoid D sensitivity
53. One effect of the detector in the Fourier domain is to attenuate spatial frequencies by the presampling MTF (modulator-transfer _____).
 A frequency B Fourier C function D fixture
54. A numerical implementation of the Fourier transform is called a _____ Fourier transform (DFT).
 A double B discrete C detector D dose

PART ELEVEN: NETWORKS, PIPES, AND CONNECTIVITY

55. The entities comprising corresponding layers on the network devices are termed:
 A levels B peers C sub domains D compartments
56. The open systems _____ (OSI) model establishes a framework for defining standards for linking heterogeneous computer networks.
 A interconnection B intermodal C internet D intercom
57. Regarding WANs (wide area networks), the _____ provide a switching matrix for the data to reach its final destination.
 A LANs (local area networks) B frame relays C PDUs (protocol data units) D nodes
58. _____ is an example of a round-robin-distributed MAC protocol that uses a token mechanism for channel band width allocation.
 A FDDO B DDFI C FDDI D IDFD
59. ATM (_____ transfer mode) can be used in the implementation of LANs by various means.
 A automatic B aperture C asynchronous D area

PART TWELVE: INTRODUCTION TO DICOM

60. Regarding the ISO 7-layer network model, layer 3 is called _____, and it has to do with switches and routes information.
A presentation B session C application D network
61. A service-object- _____ (SOP) is a concrete occurrence of an information object and communication context.
A pair B pixel C pole D provider
62. Regarding the 14 parts of the DICOM base standard, part 2, called _____, defines the structure for the required documentation.
A service class specifications B conformance C data dictionary D message exchange
63. Regarding the 14 parts of the DICOM base standard, part 7, called _____, defines the structure for DICOM services and messaging.
A data dictionary B message exchange C servicing network D data encoding
64. Regarding the 14 parts of the DICOM base standard, part 14 is called _____ standard display function.
A contrast B pixel C greyscale D brightness
65. A modality device can acquire requisite patient/study information from a worklist server such as RIS (_____ information systems).
A radiology B requisite C recall D ready
66. It is the author's opinion that no DICOM device (except _____) should be purchased that does not support HIS/RIS integration.
A image monitors B printers C transcription devices D patient data ports

PART THIRTEEN: DIAGNOSTIC AND ACCEPTANCE TESTING

67. The DICOM standard traces its history back to _____ as a joint effort between the ACR and NEMA.
A the early 1980s B the late 1990s C 2002 D 2004
68. The _____ purchasing model (of DICOM devices) can be proved to create a set of devices that will successfully communicate.
A conformant-limit B block method C closed-set D open-loop
69. The DICOM conformant-limit purchasing model (of DICOM devices) cannot even create a set of two communicating devices.
A True B False

PART FOURTEEN: PACS BROKERS: THE RIS AND HIS

70. Image acquisition combined with image management and interpretation are generally considered together as:
A EMR B HIS C RIS D PACS
71. Regarding data and image flow, an examination may be ordered through the ACP. A(n) _____ Number is then generated by RIS.
A Portal B Interface C Accession D Linking
72. Following the step in question 71, the RIS sends the order to a computer which can communicate with both the RIS and ACP – called a:
A PACS broker B ACP interchange C ACP broker D PACS interchange
73. The RIS interface, fundamentally, is the set of communication protocols for exchange of _____ between systems.
A single image data B series image data C patient information D exam technical factors

PART FIFTEEN: INTEGRATED MEDICAL IMAGING...

74. _____ is an internet communication protocol that standardizes communication between devices dealing with patient data and/or HIS.
A HL-4 B HL-7 C HL-2 D HL-5
75. _____ allows reduction in large file sizes to more manageable sizes for transfer via networks.
A Compression B Convergence C Conversion D HTTP
76. With a _____ : 1 compression ratio all data are preserved within half the storage space.
A 3 B 2 C 5 D 4

PART SIXTEEN: IMAGE COMPRESSION AND ENCRYPTION

77. _____ image compression algorithms are those in which the original image and compressed image are identical on a bit-by-bit basis.
A irreversible B reversible C complex D simple
78. Regarding image _____, the image data are transformed into a spectral domain defined by the particular basis function set.
A quantization B encoding C transformation D transference
79. _____ is the single step of the compression process that introduces irreversible alteration of the image data.
A Encoding B Transformation C Transference D Quantization

100. In the RFP example, the pricing summary sheet states that this form must be completed by:
 A the radiologist group B imaging department C hospital board D vendor
101. Section 6.1 of the RFP states that the new equipment must pass hospital inspection for safety, performance, and compliance – called:
 A “Code Uniformity” B “Inspection Phase” C “Acceptance Testing” D “Receiving Testing”
102. Section 10.2 of the RFP states that the vendor will give service instruction to the engineers:
 A only on request B during the warranty period C anytime after purchase D only at extra cost
103. Section 13.5 of the RFP defines system downtime as _____ failure to function.
 A total system B 50% of system C 70% of system D 90% of system
104. In consideration for system requirements, it is noted that with CT _____ % of raw data is saved – post-processing is immediate.
 A 25 B 50 C 100 D 0
105. Regarding on-line storage, a RAID (_____ Array of Independent Discs) will be placed in the network.
 A Redundant B Recall C Real-Time D Rotating
106. Section 3.20 of the Specifications section of the RFP pertains to image:
 A hard drive storage B recall C transference D analysis/manipulation
107. Section 5.6 of the Specifications section of the RFP pertains to CPU:
 A speed proposed B speed recommended C Bus bit size D replacement cost
108. Section 6.14 of the Specifications section of the RFP pertains to image:
 A formats available B accession numbers C pixel display D rotation
109. Section 11.14 of the Specifications section of the RFP pertains to image:
 A rotation B preview C density resolution D color

PART TWENTYTWO: A PACS CASE STUDY

110. Before PACS was implemented in the Medical University of South Carolina, the 2,000 sq. ft. film library had annual cost of:
 A \$33,000 B \$45,000 C \$56,000 D \$72,000
111. Although the ultrasound mini-PACS in the case study proved successful, it only held about _____ months of on-line data.
 A 1 B 2 C 3 D 4
112. The case study reported that installing disk capture systems was avoided with nuclear medicine due to the:
 A camera's internal computers B lack of need for them C technologist's verbal report D sharp rise in associated costs
113. At the time of writing, the current PACS system held approximately _____ months of on-line data.
 A 24 B 18 C 12 D 7

PART TWENTYTHREE: DATA MANAGEMENT AND ARCHIVE SYSTEMS

114. Regarding the prototypical storage model in data management, the _____ layer represents the highest level.
 A storage management B application C physical storage D data management
115. The _____ layer manipulates the data only at the request of the application layer in the prototypical storage model.
 A physical storage B storage management C data management D file and file system
116. The _____ layer provides standard formalisms to move data to and from physical hardware in the prototypical storage model.
 A file management B application C storage management D data management

PART TWENTYFOUR: BASIC ULTRASOUND IMAGING

117. Regarding ultrasound imaging, _____ m/s is considered the average speed of sound in soft tissue.
 A 530 B 740 C 1260 D 1540
118. Ultrasound images are by acquired transmitting acoustic pulses along beam lines and receiving _____ along each line.
 A electric pulses B visual beams C echoes D thermal pulses
119. Ultrasound pulses propagating through tissue undergo preferential attenuation of _____ frequency components.
 A higher B lower C every D flatter
120. The spatial resolution available in modern scanners is determined for the most part by the _____ performance.
 A transducer B CPU (central processing unit) C storage devices D monitor

PRACTICAL DIGITAL IMAGING AND PACS COURSE POST-TEST ANSWER SHEET

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| 24 | | 48 | | 72 | | 96 | | 120 | |