Part 12: COMPUTERS IN NUCLEAR MEDICINE

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1. The number of bits in a kilobyte is

a) 256
b) 1000
c) 2200
d) 8000
e) 8192

2. The decimal equivalent of the binary number 01101 is

a) 5
b) 7
c) 13
d) 65
e) 1101

3. The binary equivalent of the decimal number 21 is

a) 001101
b) 100111
c) 010101
d) 011101
e) 110101

4. An X-ray film digitizer produces 2048 x 2048 x 8 bit digital images. The number of gray levels captured by the digitizer is

a) 8
b) 256
c) 4194304
d) 33554432
e) insufficient information given

5. A 512 x 512 CT image that uses Hounsfield units for tissue density that range from -1000 to +1000 requires at the minimum _____ bits of memory for each pixel.

a) 11
b) 16
c) 2001
d) 262144
e) insufficient information given

6. **Correct answer: c) solid-state**. Solid-state memory is constructed of high speed transistors

fabricated onto silicon microchips. Memory type ordered from the fastest to the slowest is as follows: solid-state, magnetic disk, magneto-optical disk, CD-ROM, and magnetic tape.

7. A computer that uses RISC architecture, has

a) a reduced instruction set optimized for execution speed.
b) programs of reduced size optimized for efficient memory usage.
c) arrays of redundant inexpensive microprocessors to enhance execution speed.
d) reduced size, inexpensive, high-speed components.

8. The main memory of a general purpose computer system consists of

a) magnetic disks.
b) solid-state memory.
c) CD-ROM disks.
d) magneto-optical disks.
e) magnetic tapes.

9. Images from a gamma camera whose useful field-of-view is 380 mm in diameter are digitized to 128 x 128 matrices. The pixel cross-sectional area is _____ mm^2.

a) 0.023
b) 0.11
c) .34
d) 9
e) 36

10. The image resolution in an X-ray CT image is found to be 0.625 line pairs per mm. What is the upper limit of the pixel width in this image?

  a) 0.318 mm
  b) 0.625 mm
  c) 0.800 mm
  d) 1.250 mm
  e) 1.600 mm

11.   Digital images are archived in a compressed format. Mark true or false before each of the following statements.

___ a) In "lossy" image compression, the original image cannot be exactly restored during decompression.
___ b) Image compression by the JPEG algorithm can reduce the storage space by a factor of 100 or more.
___ c) "Lossless" data compression algorithms can achieve data compression by a factor of 100 or more.
___ d) JPEG compressed images should not be used for archival of raw image files that may be used at a later time for image reprocessing.

12. A CT image that is 512 x 512 x 2 bytes is to be transferred to a home computer over a telephone line in which 28,800 baud modems are used. The time required for transmission of this image is approximately

  a) 3 sec.
  b) 20 sec.
  c) 150 sec.
  d) 1820 sec.
  e) 2.3 hr.

13. A CT image series of 26 image slices (512 x 512 x 16 bits) requires _____ megabytes of disk storage.

  a) 0.8
  b) 13
  c) 26
  d) 112
  e) 512

14. An 8x10 inch film from a mammography unit that exhibits 12 line pairs per mm resolution is to be digitized. To preserve the film resolution, what minimal square matrix of pixels is required?

a) 1524
b) 1920
c) 3048
d) 4876
e) 6096

15. A computer monitor with a 24-bit color display card can display ___ shades of gray.

  a) 24
  b) 256
  c) 768
  d) 4096
  e) 16777216

16. Mark true or false before each of the following statements regarding computer software.

___ a) Assembly language programs are easily transported across multiple computer platforms.
___ b) FORTRAN is a programming language that is designed to be transportable across multiple computer platforms.
___ c) MS-DOS is an example of a multi-user operating system.
___ d) ASCII is the standard code for translation of printable characters.
___ e) A compiler is a program used to convert high level program code to executable binary code.

17. Mark true or false before each of the following statements regarding computer memory.

___ a) Random access memory retains its contents when pulled from the computer.
___ b) Random access memory can be configured to be read-only memory.
___ c) Solid-state memory is most likely to be used for data archival.
___ d) Optical disk systems are always ROM.

18. The maximum possible pixel count value in gamma camera byte images is

a) 127
b) 255
c) 256
d) 1023
e) 65535

19. Identify the correct sequence of computer network protocols in increasing speed of data transfer.

a) Modem, ISDN, ATM, Ethernet, FDDI
b) Modem, ATM, ISDN, Ethernet, FDDI
c) ISDN, Modem, Ethernet, FDDI, ATM
d) Modem, ISDN, Ethernet, FDDI, ATM
e) Modem, Ethernet, FDDI, ISDN, ATM

20. An array processor in a computer system

a) performs multiple numerical computations in parallel.
b) consists of an array of multiple microprocessors that increases the overall speed of a computer system.
c) manages the data storage in a large array of magnetic disks.
d) manages multiple network links in an array of computers on a local area network.