Medical Equipment (2) – Sheet #3

Part I. Complete the following sentences:

1. A tissue with half the attenuation coefficient of water will have a CT number of …
2. The highest efficiency CT scanning technology is called …

Part II. Mark the following statements as True (T) or False (F):

3. In CT, all x-ray sources are present in the gantry and all detectors are included in table.
4. It is possible to display two images for bone and soft tissues from a single CT scan using windowing.
5. In CT, all x-ray sources and detectors are included in gantry.
6. Cone beam CT is more energy efficient due to the use of beam collimation.
7. Spiral CT uses fourth generation CT scanning technology with table motion.
8. It is possible to obtain slices at any position and in any direction using spiral CT.
9. Computed tomography offers higher resolution than conventional x-rays.
10. Cone beam CT offers less patient exposure than fan beam CT.
11. In cone-beam spiral CT (CBCT) systems, it is possible to reconstruct any slice at any orientation within the scanned volume.
12. The smaller the cycle time of a CT device, the more likely motion artifacts will be.
13. The CT image is a map of the linear attenuation coefficient within the scanned section.

Part III. Answer these questions by marking the best answer from the choices given:

14. Computed tomography has an advantage over plain x-ray in that …
    a. It can reconstruct cross sectional images
    b. It involves less exposure to x-ray radiation
    c. It has higher resolution
15. Lateral x-ray tube motion was eliminated starting from … generation of CT scanners.
    a. Second
    b. Third
    c. Fourth
16. Difference between third and fourth generations of CT scanners is in …
    a. Rotational motion of detectors
    b. Lateral motion of detectors
    c. Lateral and rotational motion of detectors
17. Spiral CT scanning relies on …
    a. Table motion
    b. Fan beam scanning
    c. Both of the above
18. To generate CT images of soft tissues and bone in a patient, … is used.
    a. Two HU windows are used on the same data
    b. Two acquisitions are collected at different kV
    c. Different patient positions are used
19. To collect a 256×256 CT image, at least … projections are needed.
    a. 16384
    b. 65536
    c. 2097152

20. The central opening, into which the patient is moved during the examination is called …
    a. Table
    b. Gantry
    c. Couch
21. Parallel beam CT scanners belong to …
    a. First generation
    b. Second generation
    c. Third generation
22. To collect data for one 128x128 CT image, at least … projections are needed.
    a. 128
    b. 16384
    c. 65536
23. HU windowing is used to allow …
    a. Viewing of a particular range of HU values for better human interpretation
    b. Filtering of HU values to enhance a particular structure
    c. Selection of a region of interest in the image for further analysis
24. Phantom simulating a skull bone are used to …
    a. Add skull bone artifacts to test the reconstruction algorithm
    b. Allow more quantitative evaluation of bones in the head
    c. Avoid distortions from skull bone filters when scanning a phantom

Part IV. Answer the following problems:

25. For a tissue that has an attenuation coefficient that is half that of water, compute its CT number in HU.
26. Solve the shown reconstruction problem using algebraic reconstruction technique.