



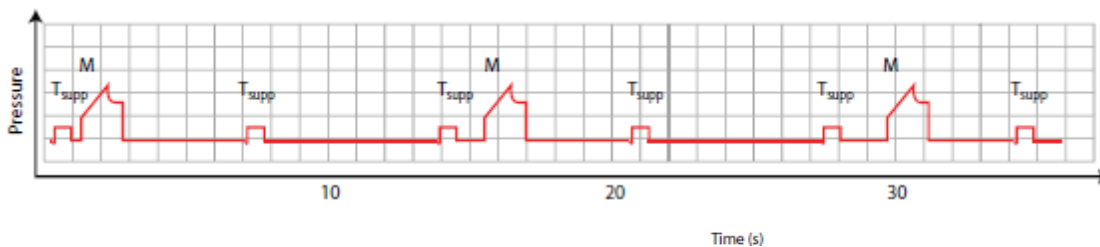
Medical Equipment II – Part 2 Term Exam – June 2011 (Solution Manual)

Solve as Much as You Can – Maximum Grade for Part 2: 25 Points

Part I. Answer these questions by marking the best answer from the choices given($\frac{3}{4}$ points each):

1. 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
2. Arterial blood line in hemodialysis machines has ... than venous blood line.
 - a. Higher pressure
 - b. Lower pressure (*)
 - c. Same pressure
3. Blood line clamp is activated in the condition when ...
 - a. Air was detected in blood (*)
 - b. High blood temperature was detected
 - c. High blood pressure was detected
4. Deaerator is used in dialysate circuit to ...
 - a. Prevent air bubbles from forming in the blood
 - b. Prevent cooling of the dialysate
 - c. Make the dialysis process more efficient (*)
5. Ultrafiltration rate measurement systems cannot be designed based on ...
 - a. Flow sensing
 - b. Balancing chamber
 - c. Pressure sensing (*)
6. To measure the ultrafiltration at required accuracy in AAMI standard using flow sensors, the flowmeters used must have an accuracy of ... (Assume the dialysate flow rate as 1L/min and assume it is required to remove 1 Kg of water from the patient every hour during the treatment)
 - a. $\pm 5\%$
 - b. $\pm 0.5\%$
 - c. $\pm 0.05\%$ (*)
7. For electrical isolation, breaking Ohmic continuity can be done using ...
 - a. Inductor
 - b. Capacitor (*)
 - c. Battery
8. The principle of operation of electrosurgical units rely on heating tissues to cause ...
 - a. Reversible cytochemical changes
 - b. Desiccation (*)
 - c. Carbonization
9. Allowing more hemostatis in electrosurgery waveform allow ...
 - a. Cutting
 - b. Spray
 - c. Blended cutting (*)
10. In CPAP, the mode of breathing is ...
 - a. Spontaneous breathing (*)
 - b. Mandatory breathing
 - c. Triggered breathing
11. The parameter that is controlled during expiration is called ...

- a. Baseline variable (*)
 - b. Trigger variable
 - c. Limit variable
12. Venturi device is used in ...
- a. Nasal cannulae
 - b. Variable performance mask
 - c. Fixed performance mask (*)
13. At higher altitudes, contact time is ... in normal altitudes at rest.
- a. Shorter than
 - b. Longer than
 - c. Same as (*)
14. Respiratory dynamics can be modeled by ...
- a. Patient circuit compliance
 - b. Equation of motion (*)
 - c. Alveolar ventilation
15. The following pressure-volume relationship describes ... breathing mode.



- a. Mandatory + Triggered (*)
 - b. Synchronized + supported
 - c. Spontaneous + Mandatory
16. Lateral x-ray tube motion was eliminated starting from ... generation of CT scanners.
- a. Second
 - b. Third (*)
 - c. Fourth
17. 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
18. Spiral CT scanning relies on ...
- a. Table motion
 - b. Fan beam scanning
 - c. Both of the above (*)
19. 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
20. To collect a 256×256 CT image, at least ... projections are needed.
- a. 16384
 - b. 65536 (*)
 - c. 2097152

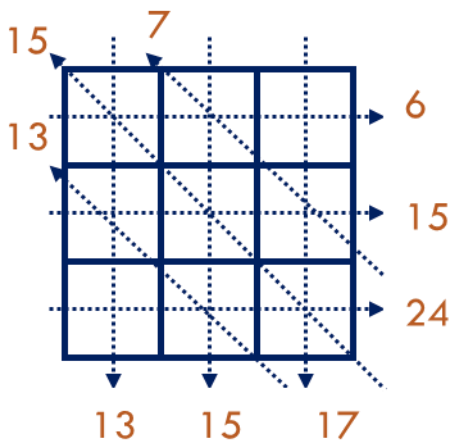
Part II. Mark the following statement as either True (T) or False (F) (¼ point each):

- 1. Bypass valve is usually activated to bypass dialyzer during alarm conditions. (T)
- 2. Blood line must be disinfected before it is used with another patient. (F)
- 3. Conductivity monitor in hemodialysis can detect condition with wrong concentrates are used. (F)

4. Chemical deposits in dialysis machine can interfere with flowmeter-based ultrafiltration control. (T)
5. Dialysis machines are not true fail-safe devices. (T)
6. Ultrasonic air-foam detectors are more widely used in new dialysis machines. (T)
7. When there is a dialysate conductivity alarm, blood circuit must stop. (T)
8. It is necessary to use a peristaltic pump for the dialysate circuit. (F)
9. It is possible to control water removal rate but not waste metabolite removal in hemodialysis. (T)
10. Coagulation of blood in extracorporeal circuit is prevented using continuous heparin infusion. (T)
11. It is possible to control the extracorporeal blood flow rate in hemodialysis. (T)
12. Modern hemodialysis systems with new safety features require no human monitoring of operation. (F)
13. Not all hemodialysis systems are equipped with pH monitor. (T)
14. Cold dialysate has been known to precipitate cardiac arrhythmias. (F)
15. Currents used for defibrillation are higher than those that cause ventricular fibrillation. (T)
16. Physiological effects of electricity do not depend on frequency for same current. (F)
17. Macroshock is more common in a surgical operation when using a catheter. (F)
18. It is necessary to isolate electrical signals but not power supply in medical devices. (F)
19. Tissue damage due to heating depends only on temperature. (F)
20. It is necessary to prevent burns due to dispersive electrode in bipolar electrosurgical mode. (F)
21. Cycle variable is one that is measured and used to end inspiration. (F)
22. While running at sea level, alveolar diffusion time is same while contact time is shorter. (T)
23. Under optimal conditions, ultrasonic nebulizers are more efficient than jet nebulizers. (T)
24. High lung compliance means that the lung expands easily. (T)
25. Surface tension inside alveoli depends on their surface area. (T)
26. Source of power to mechanical ventilators can be either electricity or compressed air. (T)
27. In CT, all x-ray sources and detectors are included in gantry. (T)
28. Cone beam CT is more energy efficient due to the use of beam collimation. (F)
29. Spiral CT is uses fourth generation CT scanning technology with table motion. (T)
30. It is possible to obtain slices at any position and in any direction using spiral CT. (T)

Part III. Solve the following reconstruction from projections problem to estimate the image using ART. (3 points)

Solution: just use ART equation for each of the provided projection once regardless of the order.



Best of Luck!