ENGR 121 - Exam 2 Practice Problems (3 Point Questions)

Below are practice problems for the three point questions found on the exam. These questions come from past exams as well additional questions created by faculty. Some of the questions below appear as fill-on-the-blank. These were taken from previous iterations of the ENGR 121 Exam. Your test will consist of only multiple choice. Please note that these are just examples of questions and may not cover all concepts that could be asked in the 3-point section on your exam.

1. A relay requires 5VDC and 800 mA to close the contacts. Using the switching technique presented in class for the solenoid valves and the heater, the 800 mA will be provided by . . .
    a. a digital output pin on the Arduino stamp
    b. the 5V voltage regulator on the Arduino
    c. an analog input on the Arduino
    d. the external power supply that plugs into a wall outlet

2. After a solenoid valve is opened and closed, it takes some time for the system to settle out to equilibrium. The DEADTIME COMPENSATION is set to allow the fishtank system to come to equilibrium before responding to error (before opening up another solenoid valve).

3. Oxidation occurs at the anode and reduction occurs at the cathode. At which electrode (the anode or the cathode?) is water broken up into OH- and H? CATHODE

4. We used DI water for the fishtank project. DI stands for Deionized.

5. Overcorrecting the salinity (adding too much salty or DI water) can cause the salinity to overshoot the setpoint. Repeatedly overcorrecting the salinity can cause the salinity values in the fishtank system to OSCILLATE about the setpoint.

6. The AIN is a proportionality constant that is set to correct the salinity from a current value to a value that is in the direction of the setpoint (but not all the way to the setpoint). We used a value such as 0.8 for our analysis.

7. The source of the electrical power that flows through the solenoid valve to close the valve comes from . . .
    a. a digital pin on the Arudino
    b. the 5V pin on the Audino
    c. the 12V power supply connected to the wall
    d. Vin on the Arduino
    e. your computer
    f. all power comes from the sun

HINT: Some electrons actually pass through the solenoid valve . . . where do they come from?

8. What happens to the electrical resistance of water as it becomes more salty?
    a. it increases
    b. it decreases
    c. it is unchanged
    d. it increases then spontaneously decreases
    e. it decreases then spontaneously increases
    f. it is unchanged at first then spontaneously increases

RESISTANCE ↓
CONDUCTIVITY ↑

9. The fish tank system has memory. That is, it takes time for the salinity of the water to become uniform. This system memory is referred to as . . .
    a. Gain
    b. Deadtime
    c. Delay
    d. Deadband
    e. UCL
    f. LCL
    g. Hysteresis

10. Oxidation occurs at the anode and reduction occurs at the cathode. At which electrode is water broken up into OH-and H?
    a. Cathode
    b. Anode
    c. Diode
    d. Erode
    e. Microelectrode
    f. Tetrode
    g. Depeche Mode

11. We used DI water for the fishtankproject. DI stands for
    a. Distilled
    b. Digital Input
    c. Daily Intake
    d. Designation Indicator
    e. Diagnostic Inspection
    f. Delay Insensitive
    g. Deionized
    h. Design Interface
    i. Delay Index
    j. Direct Injection

12. The current salinity of a fish tank system is 0.20 wt% NaCl which happens to be above the UCL. If the setpoint is 0.10 wt% NaCl and the gain is 0.6, then the target concentration for your fish tank system would be . . .
    a. 0.04 wt% NaCl
    b. 0.06 wt% NaCl
    c. 0.10 wt% NaCl
    d. 0.14 wt% NaCl
    e. 0.16 wt% NaCl

target concentration: $0.002 - (0.002 - 0.001)(0.6)$
$= 0.0014$
$= 0.14\%$ wt NaCl

13. Which of the following is a correct representation of the units of resistivity (a material property)?
    a. Ω
    b. volt·Ω
    c. Ω·m
    d. Ω m^2
    e. Ω·A

14. The proportionality constant for computing the target concentration of the water in the fish tank is…
    a. Oscillation
    b. Gain
    c. 3s
    d. Weight % Salt

15. Consider the 12VDC solenoid valve shown below, which is NOT what we used in the fishtank project. The power in watts required to actuate the valve is closest to …
    a. 1.51W
    b. 3.00W
    c. 7.52W
    d. 12.96W
    e. 15.00W
    f. 18.79W
    g. 25.92W

$P = IV = 1.08A(12V) = 12.96W$

Pinch-Style Aluminum Solenoid Valves for Tubing

- Use with water, inert gas, oil, ethylene glycol, and soap solutions
- Pressure Drop Across Valve: None required
- Temp. Range: 14° to 140° F

Ensure your process media is free from contamination. Also known as pinch valves, these pinch the outside of your tubing to stop flow, so valves never make contact with the contents.

Body is anodized aluminum and pinch mechanism is acetal copolymer. Valves are closed unless energized (normally closed). They have spade terminals for a DIN electrical connection and draw a max. of 1.08 amps. Enclosure is IP65 (resists splashing water). Mount in any position.

Note: Use with tubing with a max. durometer of 50A (tubing not included).

For Tube					12 VDC		24 VDC	
OD	ID	Lg.	Ht.	Max. psi		Each		Each
1/8"	1/16"	5/8"	2 1/8"	15	5431T111	$103.94	5431T112	$103.94