Problem values: 1-2, 4-8 = 5, 3 = 10, 9 = 20, 10 = 35

Part 1

1. Which, if any, of the set-ups below is the proper configuration for setting up a deviation loop with an offset?

a. 

![Diagram a]

b. 

![Diagram b]

c. 

![Diagram c]

d. 

![Diagram d]

e. None of the above
2. Which configuration below represents a standard regulator loop?
   a. 
   b. 
   c. 
   d. 
   e. None of the above

3. For the network above, y =
   a. -14
   b. 6
   c. 10
   d. 140
   e. None of the above
The plot above is the result of a step-response test run on an open-loop system. Answer the following questions about this system:

4. The steady-state gain of the system is
   a. 0.5  
   b. 1.0  
   c. 1.5  
   d. 2.0  
   e. None of the above

5. The time constant of the system is about
   a. 1    
   b. 2    
   c. 3    
   d. 4    
   e. None of the above

6. The steady-state error of the system is about
   a. 0    
   b. 1    
   c. 2    
   d. 3    
   e. Steady-state error is a concept inapplicable in this case

7. The reference value for the open-loop system is
   a. -2   
   b. -1   
   c. 0    
   d. 1    
   e. 2

8. At T after the input step, y =
   a. 0.632  
   b. 1.264  
   c. 1.5    
   d. 1.623  
   e. None of the above
**Name ____________________________**

**Part 2**

9. Match the concepts on the left with those on the right

<table>
<thead>
<tr>
<th>Answer</th>
<th>Put in the Answer column...</th>
<th>...the best match from this column</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measured value</td>
<td></td>
<td>A. Remembers past actions</td>
</tr>
<tr>
<td>Desired value can change often</td>
<td></td>
<td>B. Time constant</td>
</tr>
<tr>
<td>Is a symptom of P-only control</td>
<td></td>
<td>C. $K_p$</td>
</tr>
<tr>
<td>Sensor gain is 1</td>
<td></td>
<td>D. Positioner loop</td>
</tr>
<tr>
<td>Actuator output</td>
<td></td>
<td>E. Infinity</td>
</tr>
<tr>
<td>Integrator</td>
<td></td>
<td>F. Is summed with disturbance in regulator loop</td>
</tr>
<tr>
<td>Measure of system's speed</td>
<td></td>
<td>G. Regulator loop</td>
</tr>
<tr>
<td>Encountered when a step is fed through a differentiator block</td>
<td></td>
<td>H. Is subtracted off in downstream block</td>
</tr>
<tr>
<td>Disturbance value can change often</td>
<td></td>
<td>I. Measured value = actual value</td>
</tr>
<tr>
<td>Always present in controllers in the PID family</td>
<td></td>
<td>J. $e_{ss}$</td>
</tr>
</tbody>
</table>

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10. Draw the block diagram that creates the output shown below.

Use these blocks in your diagram:

![Block Diagram Blocks]

Give all the values for K's and T's, offset, start time, height, + or -, as appropriate, next to the blocks on your diagram.