

09 Counter Controller Test

Your Name:

A washing machine uses a very simple controller based on a binary up counter. The washing actions are shown in the truth table below.

Binary						
D	C	B	A	Hex	ACTION	
0	0	0	0	0	Turn on inlet valve	
0	0	0	1	1	Slow Drum Spin	
0	0	1	0	2	Pump out water	
0	0	1	1	3	Fast Drum Spin and Pump out water	
0	1	0	0	4	Turn on inlet valve	
0	1	0	1	5	Slow Drum Spin	
0	1	1	0	6	Pump out water	
0	1	1	1	7	Fast Drum Spin and Pump out water	
1	0	0	0	8	Turn on inlet valve	
1	0	0	1	9	Slow Drum Spin	
1	0	1	0	A	Pump out water	
1	0	1	1	B	Fast Drum Spin and Pump out water	
1	1	0	0	C	STOP	

1. Draw a circuit diagram with one logic gate that would detect the STOP signal. Label the inputs and output.

2. Complete this Boolean expression:

$$\text{Slow Drum Spin} = \overline{D} \cdot \overline{C} \cdot \overline{B} \cdot A +$$

3. Draw the circuit diagram corresponding to the Boolean expression above.

4. Fill in this Karnaugh map corresponding to the Boolean expression above and then draw a new simplified circuit diagram that solves the Slow Drum Spin problem..

	B A	B A	B A	B A
D C	0 0	0 1	1 1	1 0
0 0				
0 1				
1 1				
1 0				