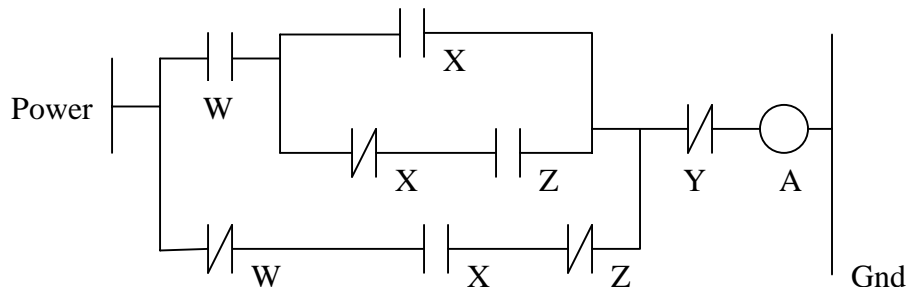


Homework: Due THURSDAY, April 12, 2001

1. Draw a relay circuit for implementing the function $T = x_1x_2' + x_1'x_2$ (exclusive or).
2. Draw a relay circuit for implementing the function $T = AB' + C(B'+D)$
3. Draw a relay circuit for implementing the function $T = x'y'z + xy'z' + xyz$.
4. Consider the function $T = x'y'w + xy'w' + xy$. Suppose that you must implement this using actual relays (as opposed to software relays), and that you only have available SPDT. SPDT means single-pole/double-throw, which means that a single leaf spring is switched between two contacts (one of which is normally closed and the other of which is normally open). This means that in your circuit, there can appear only one normally open contact and one normally closed contact for any given coil signal. Draw a relay circuit for implementing this function. (This can be done using an intermediate signal to cover the limitations of only having SPDT relays. However, this function can also be rewritten to not use any intermediate relays. A Karnaugh map can be used for this.)
5. The contacts shown below belong to four different relays, W, X, Y, and Z. Write the Boolean equation that defines the excitation of relay coil A.



6. A new game show is being developed, and you have been hired to do the electronics for the game contestants. Specifically, there are two contestants, called contestant A and contestant B, and each has a single push button, labeled PA and PB, respectively. The contestants will be asked a question, and whichever one pushes their button first will be allowed to answer the question. The button first pushed will light a colored lamp (LA or LB, respectively) for the contestant. The light then stays on until the game show host pushes a reset button. Note that only the lamp corresponding to the first contestant to push a button will light – the other contestant's lamp will stay off regardless of what he or she does with their button. Write a ladder logic program/relay diagram showing the control of lamps LA and LB. (Assume all switches are logic low except when pushed.)

