



Pltw 2.1 4 answer key boolean algebra

Embed Size (px) 344 x 292429 x 357514 x 422599 x 487Activity 2.1.7 DeMorgan's Theorems Activity 2.1.7 DeMorgans Theorems that now bear his name. Without DeMorgans Theorems, the complete simplification of logic expression would not be possible. As we will seen in later activities, DeMorgans Theorems are the foundation for the NAND and NOR logic gates. In this activity you will learn how to simplify logic expressions and digital logic circuits using DeMorgans two theorems along with the other laws of Boolean algebra. Equipment Paper & PencilProcedureUsing DeMorgans theorems and the other theorems and laws of Boolean algebra, simplify the following logic expressions. Note the theorem/law used at each simplification step. Be sure to put your answer in Sum-Of-Products (SOP) form. 1. X*Y XY2. (R+S)+(T+U) R*S+T*U RS+TU3. M+N M+N4. WX+(Y+Z) (W+X)+YZ5. PQR*PQR (PQR)(PQR)6. WXYZLets see how we would utilize DeMorgans theorems to simplify a digital logic circuit.1. Write the UN-SIMPLIFIED logic expression for the output Do-Nothing in the logic circuit.1. Write the UN-SIMPLIFIED logic expression for the output is call Do-Nothing because that is exactly what the circuit does, nothing; yet its a good example for learning about DeMorgans theorems. 2. Using DeMorgans theorems and the other theorems and laws of Boolean algebra, simplify the logic expression Do-Nothing. Be sure to put your answer in Sum-Of-Products (SOP) form. ((X+Y)+(Y*Z))+(X+Y) (X*Y)+(Y*Z)+(X*Y)+(Y*Z)+(X*Y)+(Y*Z)+(X*Y)+(Y*Z)+(X*Y)+(Y*Z)+(X*Y)+(Y*Z)+(X*Y)+(Y*Z)+(X*Y)+(Y*Z)+(X*Y)+(Y*Z)+(X*Y)+(Y*Z)+(X*Y)+(Y*Z)+(X*Y)+(Y*Z)+(X*Y)+(Y*Z)+(X*Y)+(Y*Z)+(X*Y)+(Y*Z)+(X*Y)+(Y*Z)+(X*Y)+(Y*Z)+(X*Y)+(Y*Z)+(X*Y)+(Y*Z)+(X*Y)+(Y*Z)+(Y* AOI circuit that implements the simplified logic expression Do-Nothing. For this implementation you may assume that AND & OR gates (74LS08), 2-input OR gates (74LS08), 2-input OR gates (74LS04) are available. Draw this circuit in the space provided.Conclusion1. Draw the gate equivalent for DeMorgans two theorems.2. How would you prove that the original Do-Nothing circuit, it was easy to see that the simplified version had the same output as the original do-nothing circuit.3. Your company was SO pleased with the money you saved them on the coffee vending machine project (last activity) that they romoted you to VP of engineering and given you a raise to \$100 per hour. Congratulations. Your first decision as VP is to start manufacturing the simplified version of the Do-Nothing circuit. (Did we mention that the circuit doesn't do anything?) If each GATE cost 20 and you made 100,000 units, how much of the companys money did you waste on your first project?\$220,000Did you get fired?YES.((X+Y)+(Y*Z))+(X+Y)X+YX+YY(X+Y)+(Y*Z)Y*ZY*ZYX+YXX+YProject Lead The Way, Inc.Copyright 2010DE_SV Unit 2 Lesson 2.1 Activity 2.1.7 DeMorgans Theorems Page 5 _1263144740.unknown_1263316727.unknown_1263316739.unknown_1263144746.unknown_1263144732.unknown_1263144736.unknown_1263144736.unknown_1263144732.unknown_1263144736.unknown_1263144727.unknown_1263144734.unknown_1263144732.unknown_1263144734.unknown_1263 each step, be sure to document all your work in your engineering notebook. 1. Using the following variable names and assignment conditions, create a truth table shown for your Majority Vote - Voting Machine. P: President $\rightarrow 0 = No / 1 = Yes$. S: Secretary $\rightarrow 0 = No / 1 = Yes$. T: Treasurer $\rightarrow 0 = No / 1 = Yes$. answer is in the Sum-of-Products form. F1 = P'VST + PV'ST + PV'ST + PV'ST + PVS'T + PVS'T + PVS'T + PVS'T + PVST' + PV and test your un-simplified Majority Vote - Voting Machine. Use switches for the inputs P, V, S, & T and a probe or LED circuit for the output Decision. Verify that the circuit and paste it in your engineering notebook/portfolio. 5. Using the theorems and laws of Boolean algebra, simplify the logic expression Decision. Be sure to put your answer in Sum-Of-Products (SOP) form. F = P'VST + PV'S'T + PV'PV'T + PV'S + PVF = P'VST + P(V'T + V) + PV'SF = P'VST + P(V + T) + PV'SF = P'VST + P(V + V'S) + PTF = P'VST + P(V + S) + PTF = P'VST + P(V + S)Decision. Limit your implementation to only 2-input AND gates (74LS08), 2-input OR gates (74LS04). 7. Using the CDS, enter and test your simplified Majority Vote - Voting Machine. Use switches for the inputs P, V, S, & T and a probe or LED circuit for the output Decision. Verify that the circuit is working as expected. Print a copy of the final circuit and paste it in your engineering notebook/portfolio. 8. Using the DLB, build and test the simulated. Verify that the circuit is working as expected and that the results of the simulation. Conclusion We read the problem and sorted out the important information. From that, we created a truth table from the conditions given to us. Then, we wrote the un-simplified logic expression from the computer to build a rudimentary circuit based off that equation. To follow the paths of the inputs, we changed the colors of the wires so that each electrical pathway was easily identifiable. Because of this, troubleshooting was really simple and we were able to find where the inputs, so we simplified the equation and then built a circuit on the computer using the newer equation. From this digital circuit we built a circuit using a breadboard and chips with multiple gates inside them. To test that we built it correctly, we used an LED as the signal that power was coming through. gates, 2-input OR gates, and inverters. While we were building, we tested certain electrical pathways by using LEDs to see if electricity was passing through. Thank you for your participation!

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