Homework 11 Boolean Algebra – 1

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| |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  | |  |  | | --- | --- | |  |  | | **1.** | Burger House is a fast food restaurant which wants to encourage healthy eating amongst its younger diners.   * 1. Shown below in Fig.2 is the Burger House children’s menu.   C:\core\files\questions_migrate\1490186070\H046ComputerScienceH046-01NewSAM\img\p9_01_150.png  Children receive a free toy when they select a meal (i.e. one burger, one side dish and one dessert) made up of only healthy options.   * + - Let g be a Boolean value for if a child has chosen a grilled chicken burger.     - Let s be a Boolean value for if a child has chosen salad.     - Let c be a Boolean value for if a child has chosen carrot sticks.     - Let f be a Boolean value for if a child has chosen fruit salad.     - Let t be a Boolean value for whether a child receives a toy.   Write an expression using Boolean algebra to determine whether a child receives a toy when they select a meal.   |  |  | | --- | --- | | t = | G.(S+C).F |   **[3]**   * 1. Burger House wants to add this logic into its till system. Complete the code below assuming that g,s,c,f and t are Boolean variables with the same meaning as part **(i)**.  C:\core\files\questions_migrate\1490186070\H046ComputerScienceH046-01NewSAM\img\p10_01_150.png   **[2]** | |  |  | | |
| |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  | |  |  | | --- | --- | |  |  | | **2.** | A cinema offers discounted tickets, but only under one of the following conditions:   |  |  | | --- | --- | | • | Customer is under 18 and has a student card. | | • | Customer is over 60 and has ID which proves this. |   Let:  A be Customer is under 18  B be Customer has a student card  C be Customer is over 60  D be Customer has ID  Q be Discount ticket issued  Complete the Boolean expression below:   |  |  |  | | --- | --- | --- | | Q ≡ | (A.B)+(C.D) | **[3]** | | | |
| |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  | |  |  | | --- | --- | |  |  | | **3.** | An XOR gate is shown below. Complete the truth table for XOR.  C:\core\files\questions_migrate\1480673792\H046ComputerScienceH446-01Practice\img\p14_1_150.png   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | |  |  |  | | --- | --- | --- | | A | B | Q | | 1 | 1 | 0 | | 1 | 0 | 1 | | 0 | 1 | 1 | | 0 | 0 | 0 | |  |   **[2]** | | |
| |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  | |  |  | | --- | --- | |  |  | | **4.** | A circuit contains the logic gates shown below.  C:\core\files\questions\1529405873\H046H446-CompSc-H046-01-Jun17\img\pg09_Q_03_150.png   1. Complete the logic table below.  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | |  | **A** | **B** | **C** | **D** | **Output** | |  | 1 | 1 | 1 | 1 | 1 | |  | 1 | 1 | 1 | 0 | 1 | |  | 1 | 1 | 0 | 1 | 1 | |  | 1 | 1 | 0 | 0 | 1 | |  | 1 | 0 | 1 | 1 | 1 | |  | 1 | 0 | 1 | 0 | 1 | |  | 1 | 0 | 0 | 1 | 1 | |  | 1 | 0 | 0 | 0 | 1 | |  | 0 | 1 | 1 | 1 | 1 | |  | 0 | 1 | 1 | 0 | 1 | |  | 0 | 1 | 0 | 1 | 1 | |  | 0 | 1 | 0 | 0 | 1 | |  | 0 | 0 | 1 | 1 | 1 | |  | 0 | 0 | 1 | 0 | 1 | |  | 0 | 0 | 0 | 1 | 1 | |  | 0 | 0 | 0 | 0 | 0 |   **[4]**   1. Complete the Boolean expression below to represent the circuit.  |  | | --- | | Output ≡ (A+B)+(C+D) |   **[2]** | | |
| |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | |  | |  |  | | --- | --- | |  |  | | **5.** | |  |  | | --- | --- | | Draw a logic gate diagram to represent the expression below.  (¬A ⋀ B) ⋁ (¬C ⋀ D) | **[4]** | | | |
| |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | |  | |  |  | | --- | --- | |  |  | | **6(a).** | Draw an XOR gate.   |  |  | | --- | --- | |  | **[1]** | | |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | |  | |  |  | | --- | --- | |  |  | | **(b).** | Explain the difference in the function of OR and XOR gates.  .   OR is the function when A is TRUE OR B is TRUE OR both A and B is true, however   XOR is the function when ONLY A is TRUE OR B is TRUE, excluding both A and B being true    **[2]** | | |
| |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  | |  |  | | --- | --- | |  |  | | **7.** | A cinema offers discounted tickets, but only under one of the following conditions:   |  |  | | --- | --- | | • | Customer is under 18 and has a student card. | | • | Customer is over 60 and has ID which proves this. |   Let:  A be Customer is under 18 B be Customer has a student card C be Customer is over 60 D be Customer has ID Q be Discount ticket issued  The cinema has a voucher which promises free popcorn when the voucher is produced whilst buying a soft drink or bottle of water.  Let:  E be Voucher is shown F be Soft drink is bought G be Bottle of water is bought R be Free popcorn given. This could be written as:  R ≡ (E⋀F) ⋁ (E⋀G)   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **E** | **F** | **G** | **(E⋀F)** | **(E⋀G)** | **(E⋀F)⋁(E⋀G)** | | 1 | 1 | 1 | 1 | 1 | 1 | | 1 | 1 | 0 | 1 | 0 | 1 | | 1 | 0 | 1 | 0 | 1 | 1 | | 1 | 0 | 0 | 0 | 0 | 0 | | 0 | 1 | 1 | 0 | 0 | 0 | | 0 | 1 | 0 | 0 | 0 | 0 | | 0 | 0 | 1 | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | 0 | 0 |  1. Complete the truth table below.  |  | | --- | | **[4]** |  1. Simplify the expression  (E⋀F) ⋁ (E⋀G)   E.(F+G)  **[2]** | | |

**END OF QUESTION paper**