CMPSC 360: Homework 01

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Given $|A| = n \implies |P(A)| = 2^n$, demonstrate the power set for: $P(A) = 7,4,5,0,9$

Since $|A| = 5$, we know that $|P(A)| = 2^5$, therefore $P(A)$ has 32 subsets.

$P = (\{\}, \{7\}, \{4\}, \{7,4\}, \{5\}, \{7,5\}, \{4,5\}, \{7,4,5\}, \{0\}, \{7,0\}, \{4,0\}, \{7,4,0\}, \{5,0\}, \{7,5,0\}, \{4,5,0\}, \{7,4,5,0\},$
$\{9\}, \{7,9\}, \{4,9\}, \{7,4,9\}, \{5,9\}, \{7,5,9\}, \{4,5,9\}, \{7,4,5,9\}, \{0,9\}, \{7,0,9\}, \{4,0,9\}, \{7,4,0,9\}, \{5,0,9\},$
$\{7,5,0,9\}, \{4,5,0,9\}, \{7,4,5,0,9\})$

Check if the expression $[\neg(P \iff Q) \wedge R] \iff [\neg R \vee ((P \vee Q) \vee (P \wedge Q))]$

(a) is a tautology, contradiction or contingency.

(b) Make a truth table for this set.

(c) Make the Venn diagram representation.

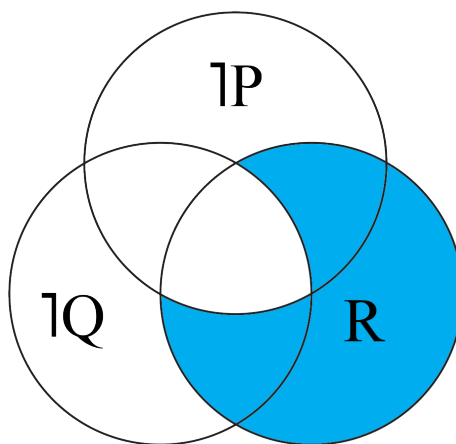(d) Make the logic circuit gate representation.

(e) Make the code representation.

a)

The expression is a contingency and simplifies to $R \wedge (\neg P \vee \neg Q)$.
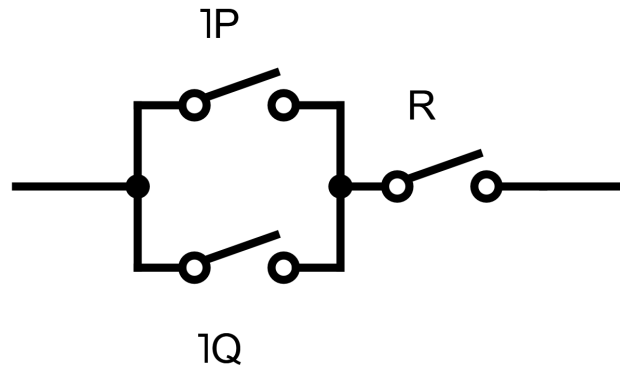
b)

P	Q	R	P∧Q	P∨Q	P↔Q	⅂(P↔Q)	(P∨Q)∨(P∧Q)	⅂R	⅂(P↔Q)∧R	⅂R∨((P∨Q)∨(P∧Q))	⅂(P↔Q)∧R↔⅂R∨((P∨Q)∨(P∧Q))
T	T	T	T	T	T	F	T	F	F	T	F
T	T	F	T	T	T	F	T	T	F	T	F
T	F	T	F	T	F	T	T	F	T	T	T
T	F	F	F	T	F	T	T	T	F	T	F
F	T	T	F	T	F	T	T	F	T	T	T
F	T	F	F	T	F	T	T	T	F	T	F
F	F	T	F	F	T	F	F	F	F	F	T
F	F	F	F	F	T	F	F	T	F	T	F

c)

d)

e)

```cpp
#include "stdafx.h"
#include <iostream>
using namespace std;
int main()
{
        // ————————————————————————————————————————————
        // BEGIN HOMEWORK 1
        // ————————————————————————————————————————————
        int hw1_i;
        const int hw1_total_columns = 3;
        const int hw1_total_rows = 8;
        struct mydata
        {
                int gate[hw1_total_columns];
        }
        circuit[hw1_total_rows] = { { 1, 1, 1 },
                                    { 1, 1, 0 },
                                    { 1, 0, 1 },
                                    { 1, 0, 0 },
                                    { 0, 1, 1 },
                                    { 0, 1, 0 },
                                    { 0, 0, 1 },
                                    { 0, 0, 0 } };

        cout << "————————Homework 1: Truth Table————————" << endl;
        for (hw1_i = 0; hw1_i < hw1_total_rows; hw1_i++)
        {
                if (circuit[hw1_i].gate[2] &&
                        (!circuit[hw1_i].gate[0] || !circuit[hw1_i].gate[1]))
                {
                        cout << "True  - ON:  " << circuit[hw1_i].gate[0]
                                << " " << circuit[hw1_i].gate[1]
                                << " " << circuit[hw1_i].gate[2]
                                << " | 1" << endl;
                }
                else
                {
                        cout << "False - OFF: " << circuit[hw1_i].gate[0]
                                << " " << circuit[hw1_i].gate[1]
```
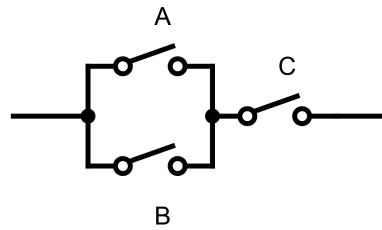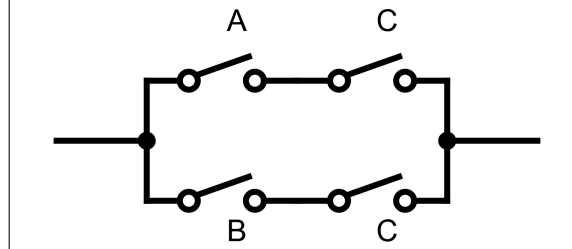
```
                              << "␣" << circuit[hw1_i].gate[2]
                              << "␣|␣0" << endl;
            }
        }
        // ——————————————————————————————————————
        // END HOMEWORK 1
        // ——————————————————————————————————————
        cout << "\nPress␣enter␣to␣end." << endl;
        getchar();
        return 0;
}
```

PROBLEM 3

Simplify:

PROBLEM 4

Simplify: