Name: **SOURAV SAMANTA**
ASU ID: **1207860455** **Project 2 – User Manual**

####################################

Python Script: "**Project2.py**"

####################################

Python Version: 2.7

Author: Sourav Samanta
Python Packages Used: re
sys

##

Execution Steps:

The Program "**Project2.py**" operates in 2 modes:

```
E:\My Stuff\A S U\CEN 598\Programming Assignments\2\Project2.py
------------------------------------------------------
Option 1:       Test Mode
Option 2:       Interactive Mode
------------------------------------------------------
Enter Option:
```

Option 1: Test Mode

The test mode sets the input to test for conditions such as:

- Cube Identities
  1. a.0 = 0
  2. a.1 = a
  3. a.~a = 0
  4. a + 0 = a
  5. a + 1 = 1
  6. a + ~a = 1

```
------------------------------------------------------------
Option 1:       Test Mode
Option 2:       Interactive Mode
------------------------------------------------------------
Enter Option:   1
------------------------------------------------------------
Input Cube:             0.c.b.d
Output Cube:            0
- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -
Input Cube:             1.c.b.d
Output Cube:            c.b.d
- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -
Input Cube:             c.b.d.~b
Output Cube:            0
- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -
Input Cube:             c.b.d
Output Cube:            c.b.d
- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -
Input Sop:              a.c.b + 0
Output Sop:             a.c.b
- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -
Input Sop:              1 + a.c.b
Output Sop:             1
- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -
Input Sop:              a + ~a
Output Sop:             1
- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -
```

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- Consensus

  1: There is exactly one element x (consensus element) that appears in one form in of the subsets and the other form in the other subset.
  2: No Consensus if more than one element varies
  3: No Consensus if no one element varies

```
- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -
Input Sop:              a.c.b.d + a.b.~c
Consensus:              a.b.d
- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -
Input Sop:              a.~b.~c + a.c.b.d
Consensus:
- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -
Input Sop:              a.c.b + c.b.e.d
Consensus:
- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -
```

- Cube Containment

```
- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -
Input Cubes:            (c.b.d) & (a.c.b.d)
Cube Containment:       Cube (c.b.d) contained in Cube (a.c.b.d) ? False
Cube Containment:       Cube (a.c.b.d) contained in Cube (c.b.d) ? True
- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -
```

- Complete SOS

```
================================================================================
Input SOP:              a.b + ~b.c + c.b.d

---------------------- COMPUTATION ----------------------

----------------- Step-1: -----------------
Reduced SOP:    a.b + ~b.c + c.b.d
Consensus:      a.c + c.d
Updated SOP:    a.b + ~b.c + c.d + a.c + c.b.d

----------------- Step-2: -----------------
Reduced SOP:    a.b + ~b.c + c.d + a.c
Consensus:      a.c

================================================================================
Complete SOS:           a.b + ~b.c + c.d + a.c
================================================================================
```

Option 2: Interactive Mode

The Interactive mode accepts user Input in SOP format and computes the Complete SOP:

```
-----------------------------------------------------
Option 1:       Test Mode
Option 2:       Interactive Mode
-----------------------------------------------------
Enter Option:   2
-----------------------------------------------------
Sample SOP format:      c.b.d + a.b + ~b.c
Enter SOP:
```

Note: Input SOP should be supplied in the Sample SOP format shown otherwise it will issue an error.

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```
Input SOP:      y.x + x.z.~t.~y + ~x.y.~z + ~y.t

---------------------- COMPUTATION ----------------------

----------------- Step-1: -----------------
Reduced SOP:    y.x + x.z.~t.~y + ~x.y.~z + ~y.t
Consensus:      x.z.~t + y.~z + x.t + ~y.z.x + ~x.~z.t
Updated SOP:    y.x + ~x.y.~z + x.z.~t.~y + x.t + ~x.~z.t + y.~z + x.z.~t + ~y.z.x + ~y.t

----------------- Step-2: -----------------
Reduced SOP:    y.x + x.t + ~x.~z.t + y.~z + x.z.~t + ~y.z.x + ~y.t
Consensus:      y.~z.t + ~z.t + x.z.~y + x.z + y.x.~t + x.t
Updated SOP:    y.x + x.t + y.~z.t + x.t + ~x.~z.t + y.~z + x.z.~t + ~y.z.x + ~z.t + x.z.~y + x.z + y.x.~t + ~y.t

----------------- Step-3: -----------------
Reduced SOP:    y.x + y.~z + ~z.t + x.z + ~y.t
Consensus:      y.x + x.t + ~z.t
Updated SOP:    y.x + y.x + ~z.t + y.~z + x.t + ~z.t + x.z + ~y.t

----------------- Step-4: -----------------
Reduced SOP:    y.~z + x.t + x.z + ~y.t
Consensus:      ~z.t + y.x
Updated SOP:    ~z.t + y.x + y.~z + x.t + x.z + ~y.t

----------------- Step-5: -----------------
Reduced SOP:    ~z.t + y.x + y.~z + x.t + x.z + ~y.t
Consensus:      ~z.t + x.t + y.x

=--==--==--==--==--==--==--==--==--==--==--==--==--==--==--==--==--==--==--==--==--==--=
--------------------- RESULTS ---------------------

Complete SOS:   ~z.t + y.x + y.~z + x.t + x.z + ~y.t
================================================================================
```

Test Scenarios:

1. Invalid Option provided in the input

```
-------------------------------------
Option 1:       Test Mode
Option 2:       Interactive Mode
-------------------------------------
Enter Option:   4
-------------------------------------
Sorry. Invalid option!!!
```

2. Invalid Input

```
-------------------------------------
Option 1:       Test Mode
Option 2:       Interactive Mode
-------------------------------------
Enter Option:   so
=====================================
Oops! There was an Error.
```

3. Invalid Characters provided in the Input SOP (Allowed characters: a-z A-Z 0 1 + . ~)

Note: ~ represents complement of a character

```
Option 2:       Interactive Mode
-----------------------------------------
Enter Option:   2
-----------------------------------------
Sample SOP format:      c.b.d + a.b + ~b.c
Enter SOP:              a.b.c + d.@.k
=========================================
Only a-z A-Z + . ~ 0 1 allowed.
```

4. Cube provided without the literals separated by .

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```
Option 2:       Interactive Mode
-----------------------------------------------
Enter Option:   2
-----------------------------------------------
Sample SOP format:      c.b.d + a.b + ~b.c
Enter SOP:              abc + j.k
===============================================
'abc' is an Invalid Input!!!
```