1. Write a python program to solve the following crypt arithmetic problem using CSP.

```
  T W O
+ T W O
-------
F O U R
-------
```

Program :

```
from constraint import Problem

def solve_cryptarithmetic():
    problem = Problem()

    # Define the variables and their domains
    problem.addVariables(['T', 'W', 'O', 'F', 'U', 'R'], range(10))

    # Define the constraints
    problem.addConstraint(lambda T, W, O, F, U, R: T != 0 and F != 0)  # T and F cannot be 0
     problem.addConstraint(lambda T, W, O, F, U, R: 100 * T + 10 * W + O + 100 * T + 10 * W + O == 1000 * F + 100 * O + 10 * U + R)

    # Find the solution
    solutions = problem.getSolutions()

    # Print the solution
    if solutions:
```

```
        for solution in solutions:
            print("Solution:")
            print("  T W O")
            print("+ T W O")
            print("--------")
            print("  F O U R")
            print("\nValues:")
            for var in ['T', 'W', 'O', 'F', 'U', 'R']:
                print(f"  {var} = {solution[var]}")
    else:
        print("No solution found.")


# Solve the cryptarithmetic problem
solve_cryptarithmetic()
```

Output :

```
Solution:
  T W O
+ T W O
--------
  F O U R

Values:
  T = 9
  W = 9
  O = 9
  F = 1
  U = 9
  R = 8
Solution:
```

```
  T W O
+ T W O
--------
  F O U R
```

Values:
  T = 9
  W = 8
  O = 9
  F = 1
  U = 7
  R = 8
Solution:
```
  T W O
+ T W O
--------
  F O U R
```

Values:
  T = 9
  W = 7
  O = 9
  F = 1
  U = 5
  R = 8
Solution:
```
  T W O
+ T W O
--------
  F O U R
```

Values:
  T = 9
  W = 6
  O = 9
  F = 1
  U = 3
  R = 8
Solution:
```
  T W O
+ T W O
--------
  F O U R
```

Values:
  T = 9

W = 5
O = 9
F = 1
U = 1
R = 8
Solution:
T W O
+ T W O

F O U R

Values:
T = 9
W = 4
O = 8
F = 1
U = 9
R = 6
Solution:
T W O
+ T W O

F O U R

Values:
T = 9
W = 3
O = 8
F = 1
U = 7
R = 6
Solution:
T W O
+ T W O

F O U R

Values:
T = 9
W = 2
O = 8
F = 1
U = 5
R = 6
Solution:
T W O

```
+ T W O
--------
  F O U R

Values:
  T = 9
  W = 1
  O = 8
  F = 1
  U = 3
  R = 6
Solution:
  T W O
+ T W O
--------
  F O U R

Values:
  T = 9
  W = 0
  O = 8
  F = 1
  U = 1
  R = 6
Solution:
  T W O
+ T W O
--------
  F O U R

Values:
  T = 8
  W = 9
  O = 7
  F = 1
  U = 9
  R = 4
Solution:
  T W O
+ T W O
--------
  F O U R

Values:
  T = 8
  W = 8
```

O = 7
F = 1
U = 7
R = 4
Solution:
T W O
+ T W O

F O U R

Values:
T = 8
W = 7
O = 7
F = 1
U = 5
R = 4
Solution:
T W O
+ T W O

F O U R

Values:
T = 8
W = 6
O = 7
F = 1
U = 3
R = 4
Solution:
T W O
+ T W O

F O U R

Values:
T = 8
W = 5
O = 7
F = 1
U = 1
R = 4
Solution:
T W O
+ T W O

 F O U R

Values:
 T = 8
 W = 4
 O = 6
 F = 1
 U = 9
 R = 2
Solution:
 T W O
+ T W O

 F O U R

Values:
 T = 8
 W = 3
 O = 6
 F = 1
 U = 7
 R = 2
Solution:
 T W O
+ T W O

 F O U R

Values:
 T = 8
 W = 2
 O = 6
 F = 1
 U = 5
 R = 2
Solution:
 T W O
+ T W O

 F O U R

Values:
 T = 8
 W = 1
 O = 6

F = 1
U = 3
R = 2
Solution:
T W O
+ T W O

F O U R

Values:
T = 8
W = 0
O = 6
F = 1
U = 1
R = 2
Solution:
T W O
+ T W O

F O U R

Values:
T = 7
W = 9
O = 5
F = 1
U = 9
R = 0
Solution:
T W O
+ T W O

F O U R

Values:
T = 7
W = 8
O = 5
F = 1
U = 7
R = 0
Solution:
T W O
+ T W O

```
  F O U R

Values:
  T = 7
  W = 7
  O = 5
  F = 1
  U = 5
  R = 0
Solution:
  T W O
+ T W O
--------
  F O U R

Values:
  T = 7
  W = 6
  O = 5
  F = 1
  U = 3
  R = 0
Solution:
  T W O
+ T W O
--------
  F O U R

Values:
  T = 7
  W = 5
  O = 5
  F = 1
  U = 1
  R = 0
Solution:
  T W O
+ T W O
--------
  F O U R

Values:
  T = 7
  W = 4
  O = 4
  F = 1
```

```
  U = 8
  R = 8
Solution:
  T W O
+ T W O
--------
  F O U R

Values:
  T = 7
  W = 3
  O = 4
  F = 1
  U = 6
  R = 8
Solution:
  T W O
+ T W O
--------
  F O U R

Values:
  T = 7
  W = 2
  O = 4
  F = 1
  U = 4
  R = 8
Solution:
  T W O
+ T W O
--------
  F O U R

Values:
  T = 7
  W = 1
  O = 4
  F = 1
  U = 2
  R = 8
Solution:
  T W O
+ T W O
--------
  F O U R
```

```
Values:
  T = 7
  W = 0
  O = 4
  F = 1
  U = 0
  R = 8
Solution:
  T W O
+ T W O
--------
  F O U R

Values:
  T = 6
  W = 9
  O = 3
  F = 1
  U = 8
  R = 6
Solution:
  T W O
+ T W O
--------
  F O U R

Values:
  T = 6
  W = 8
  O = 3
  F = 1
  U = 6
  R = 6
Solution:
  T W O
+ T W O
--------
  F O U R

Values:
  T = 6
  W = 7
  O = 3
  F = 1
  U = 4
```

R = 6
Solution:
T W O
+ T W O

F O U R

Values:
T = 6
W = 6
O = 3
F = 1
U = 2
R = 6
Solution:
T W O
+ T W O

F O U R

Values:
T = 6
W = 5
O = 3
F = 1
U = 0
R = 6
Solution:
T W O
+ T W O

F O U R

Values:
T = 6
W = 4
O = 2
F = 1
U = 8
R = 4
Solution:
T W O
+ T W O

F O U R

Values:
  T = 6
  W = 3
  O = 2
  F = 1
  U = 6
  R = 4
Solution:
  T W O
+ T W O

  F O U R

Values:
  T = 6
  W = 2
  O = 2
  F = 1
  U = 4
  R = 4
Solution:
  T W O
+ T W O

  F O U R

Values:
  T = 6
  W = 1
  O = 2
  F = 1
  U = 2
  R = 4
Solution:
  T W O
+ T W O

  F O U R

Values:
  T = 6
  W = 0
  O = 2
  F = 1
  U = 0
  R = 4

Solution:
  T W O
+ T W O

  F O U R

Values:
  T = 5
  W = 9
  O = 1
  F = 1
  U = 8
  R = 2
Solution:
  T W O
+ T W O

  F O U R

Values:
  T = 5
  W = 8
  O = 1
  F = 1
  U = 6
  R = 2
Solution:
  T W O
+ T W O

  F O U R

Values:
  T = 5
  W = 7
  O = 1
  F = 1
  U = 4
  R = 2
Solution:
  T W O
+ T W O

  F O U R

Values:

T = 5
W = 6
O = 1
F = 1
U = 2
R = 2
Solution:
T W O
+ T W O

F O U R

Values:
T = 5
W = 5
O = 1
F = 1
U = 0
R = 2
Solution:
T W O
+ T W O

F O U R

Values:
T = 5
W = 4
O = 0
F = 1
U = 8
R = 0
Solution:
T W O
+ T W O

F O U R

Values:
T = 5
W = 3
O = 0
F = 1
U = 6
R = 0
Solution:

```
  T W O
+ T W O
--------
  F O U R
```

Values:
  T = 5
  W = 2
  O = 0
  F = 1
  U = 4
  R = 0
Solution:
```
  T W O
+ T W O
--------
  F O U R
```

Values:
  T = 5
  W = 1
  O = 0
  F = 1
  U = 2
  R = 0
Solution:
```
  T W O
+ T W O
--------
  F O U R
```

Values:
  T = 5
  W = 0
  O = 0
  F = 1
  U = 0
  R = 0