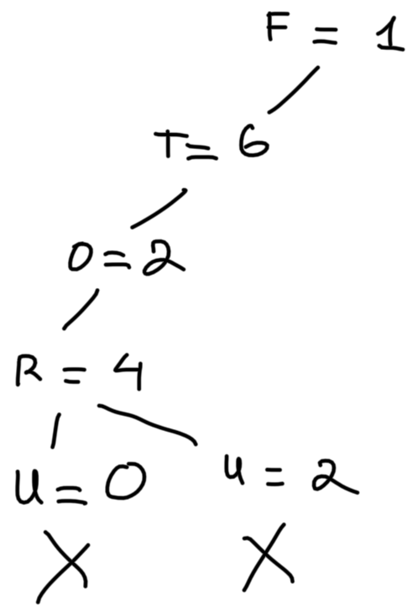
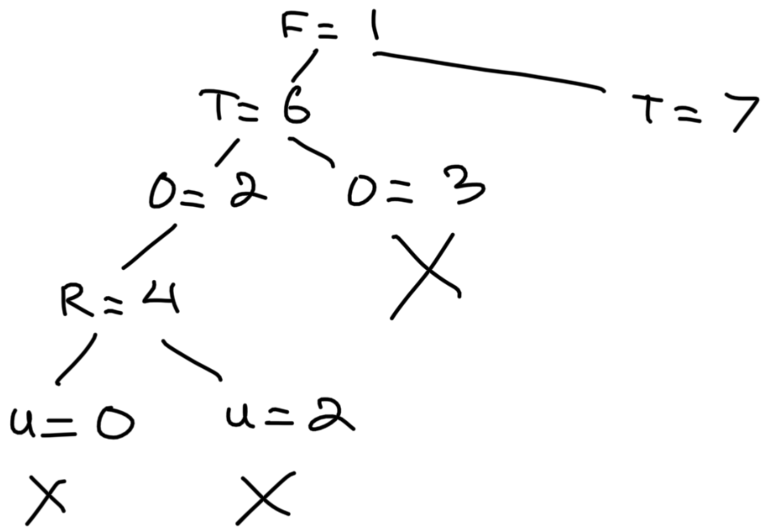
CSP - HOMEWORK : CRYPTARITHMETIC PROBLEM

Solution 1:

- Firstly, F can take the value 0 or 1, however the leading digit cannot be 0, thus we always have that F = 1.
- The possible digits for W, O, U, R is now {0, 1, 2,…, 9} and for T is {2, 3,…, 9} -> By **MRV**, we choose the value for T first.
- Now consider the constraint C3: X2 + T + T = O + 10*X3 -> O = X2 + 2T - 10*X3 -> T can take any value in {6, 7, 8}. By **LCV**, we choose T = 6.
- Therefore we can yield that O = {2, 3}. Choose O = 2 for the next step, X2 now equals to 0.
- Consider the constraint C1: 4 = R + 10*X1, R can only take the value 4 -> X1 = 0
- Now the constraint C2 becomes 2W = U -> U = {0, 8}. However, U = 0 yiels W = 0 (violates the *AllDiff* constraint), and U = 8 yields W = 4 (also violates the *AllDiff* constraint). Therefore we backtrack to O and set O = 3.

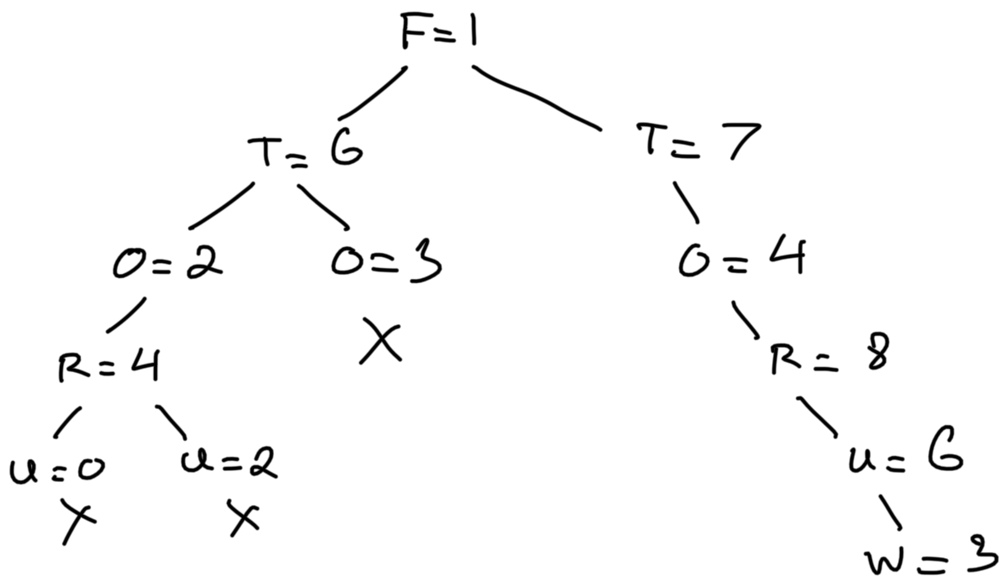


- For O = 3, X2 is now 1 -> R= 6. However, this value of R violates the constraint thus we backtrack to T = 6.
- Set T = 7, we begin the new step.



- For T = 7, O can take values in {4, 5}. Choose O = 4, now the constraint C1 becomes 8 = R + 10X1 -> R = 8 and X1 = 0.
- Consider the constraint C2, we have 2W = U where U = {0, 2, 6}. By **LCV**, we can choose U = 6 -> W = 3. All values are obtained and satisfied.

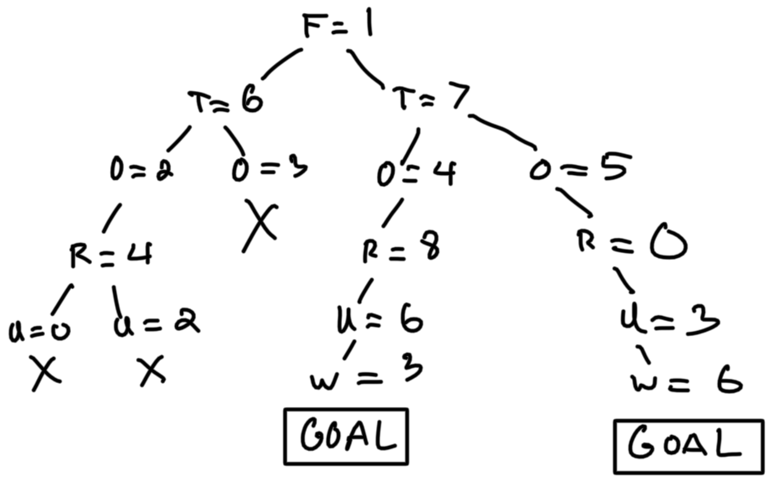
Final solution: T=7 W=3 O=4 F=1 U=6 R=8



Solution 2:

- Continuing at T = 7 from the above solution, now consider O = 5 -> X2 = 1, we have the only possible value for R is now 0 -> X1 = 0.
- For X1=0, we yield that 1+2W = U -> U = 3 and W = 6. All values are obtained and satisfied.

Final solution: T=7 W=6 O=5 F=1 U=3 R=0



Two solutions deduced from the above strategy:

T=7 W=3 O=4 F=1 U=6 R=8

T=7 W=6 O=5 F=1 U=3 R=0