CS-211: Discrete Math

Assignment 1Set Operations:

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• Assignment Implementation:

Code and Implementation can be found over here:

https://github.com/MohamedMashaal/Set-Operation-Simulator

• Problem Statement:

Write a program that takes an input a list of strings as a Universe, then takes another input a number of sets (that are subsets of the universe) then ask the user about the operations they want to perform:

- Union of two sets
- Intersection of two sets
- Complement of a set

Used data structures:

- Java ArrayList.

• Algorithms used documented:

```
-Union:
Method takes 2 sets and returns the union.
(ArrayList1<String>, ArrayList2<String>){
ArrayList<String> uniRes ---> ArrayList1;
    for(String x : ArrayList2){
      if(!uniRes.contains(x))
         uniRes.add(x);
    return uniRes;
}
-Intersection:
Method takes 2 sets and returns the intersection.
(ArrayList1<String>, ArrayList2<String>){
ArrayList<String> intRes;
    for(String x : ArrayList1){
      if(ArrayList2.contains(x))
         intRes.add(x);
    return return intRes;
-Complement :
Method takes 1 sets and returns the complement.
(ArrayList){
ArrayList<String> compRes ----> Universe;
    for(String x : ArrayList)
         compRes.remove(x);
    return compRes;
```

• Design and Assumption:

Though Problem Statement assumed that universe gets inserted at first then subsets then the user gets to specify what to do .

The Assignment was implemented using Java Swing for a GUI to allow User more freedom, more functionality and to be more user friendly.

The GUI and Event Driven Programming with The ArrayLists allowed the user a more Dynamic Sets, User is allowed to add elements to the universe or the subsets whenever he requires it plus executing whatever functionality (union, intersection, complement) whenever he wants.

User is given the freedom to add duplicated elements to any set however any duplicate elements aren't considered as a check is being executed when the user adds an element to a specific set since sets don't allow repetition.

Set 0 is assumed to be the universe and subsets are indexed 1, 2, A label with such instruction has been set to inform the user of such thing.

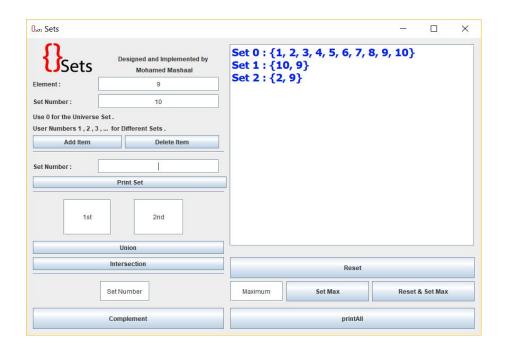
-- The Assignment was implemented at first using HashSets , then ArrayLists were used instead .(Both are included in the Assignment Implementation) .

P.S: The Assignment could implemented with the Help of the Hint as an ArrayList of Strings representing the Universe then Subsets implemented Using ArrayLists of bits mapping to Those Strings , Union can be achieved by Oring ($| \cdot |$) two Subsets while Intersection can be achieved by Anding (&&) two Subsets as for the complement it could be achieved by XORing ($^{\land}$) Universe with the Subset .

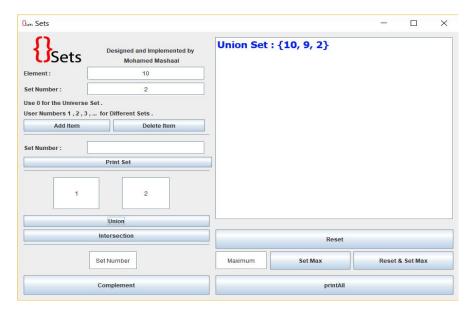
• Sample Runs:

- Set 0 : Represents the Universe {1,2,3,4,5,6,7,8,9,10}

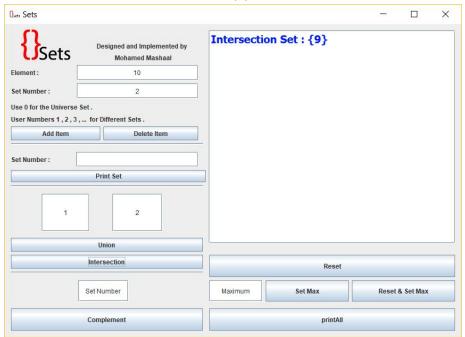
Set1: {9,10} Set2: {2,9}



Set 1 & Set 2 Union: {2,9,10}



Set 1 & Set 2 Intersection: {9}



Set 1 Complement: {1,2,3,4,5,6,7,8}

