ATMA RAM SANATAN DHARM COLLEGE

Course Title: Discrete Mathematical Structure Practical

Submitted To:

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Submitted By:

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Course : B.Sc. Computer Science Hons.

1. Create a class SET. Create member functions to perform the following SET operations:
   1) ismember: check whether an element belongs to the set or not and return value as true/false.
   2) powerset: list all the elements of the power set of a set
   3) subset: Check whether one set is a subset of the other or not.
   4) union and Intersection of two Sets.
   5) complement: Assume Universal Set as per the input elements from the user.
   6) set Difference and Symmetric Difference between two sets.
   7) cartesian Product of Sets.

Write a menu driven program to perform the above functions on an instance of the SET class.

Code:

1.py > SET

```python
class SET:
    # initiallising the class SET
    def __init__(self, elements):
        self.elements = elements

    # defining the ismember method to check whether an element is member or not.
    def ismember(self, element):
        return element in self.elements

    # defining the powerset method to write the poweset.
    def powerset(self):
        # as phi is the subset of everyset so intially defining it
        power_set = [[]]
        for element in self.elements:
            subsets = []
            for subset in power_set:
                subsets.append(subset + [element])
            power_set += subsets
        return power_set

    # defining the subset method to check whether a subset is subset of other or not.
    def subset(self, other_set):
        return set(self.elements).issubset(other_set.elements)

    # defining the union method to find the union of two sets
    def union(self, other_set):
        return set(self.elements).union(other_set.elements)

```

```
    # defining the intersection method to find the intersection of two sets
    def intersection(self, other_set):
        return set(self.elements).intersection(other_set.elements)

    # defining the complement method to find the complement relative to universal set provided by user
    def complement(self, universal_set):
        return set(universal_set.elements).difference(self.elements)

    # defining the difference method to find the difference of two sets
    def difference(self, other_set):
        return set(self.elements).difference(other_set.elements)

    # defining the symmetric_difference method to find the symmetric_difference of two sets
    def symmetric_difference(self, other_set):
        return set(self.elements).symmetric_difference(other_set.elements)

    # defining the cartesian_product method to find the cartesian product of two sets
    def cartesian_product(self, other_set):
        cartesian = []
        for element1 in self.elements:
            for element2 in other_set.elements:
                cartesian.append((element1, element2))
        return cartesian

def main():
    print('SET Operations Menu \n')
    print("1. Check membership")
    print("2. Power set")
    print("3. Check subset")
    print("4. Union")
    print("5. Intersection")
    print("6. Complement")
    print("7. Set difference")
    print("8. Symmetric difference")
    print("9. Cartesian product")

    choice = input('\nEnter your choice: ')
    print()
    # Taking input for two sets
    print('Type the elements separated by comma\n')
    set1 = SET(input('Enter elements for set 1: ').split(','))
    set2 = SET(input('Enter elements for set 2: ').split(','))

    # Print the elements of set1 and set2
    print("\nSET 1: {" + ', '.join(set1.elements) + "}")
    print("SET 2: {" + ', '.join(set2.elements) + "}")

    if choice == '1':
        element = input('Enter the element to check membership: ')
        print(f"Is {element} a member of set 1? {set1.ismember(element)}")
        print(f"Is {element} a member of set 2? {set2.ismember(element)}")

    elif choice == '2':
        print("Power set of set 1:", set1.powerset())
        print("Power set of set 2:", set2.powerset())

    elif choice == '3':
        print(f"Is set 1 a subset of set 2? {set1.subset(set2)}")
        print(f"Is set 2 a subset of set 1? {set2.subset(set1)}")

    elif choice == '4':
        print("Union of set 1 and set 2:", set1.union(set2))
```

```
91
92      elif choice == '5':
93          print("Intersection of set 1 and set 2:", set1.intersection(set2))
94
95      elif choice == '6':
96          universal_set = SET(input("Enter elements for the universal set (comma-separated): ").split(','))
97          print("Complement of set 1:", set1.complement(universal_set))
98          print("Complement of set 2:", set2.complement(universal_set))
99
100     elif choice == '7':
101         print("Difference of set 1 and set 2:", set1.difference(set2))
102         print("Difference of set 2 and set 1:", set2.difference(set1))
103
104     elif choice == '8':
105         print("Symmetric difference of set 1 and set 2:", set1.symmetric_difference(set2))
106
107     elif choice == '9':
108         print("Cartesian product of set 1 and set 2:", set1.cartesian_product(set2))
109     else:
110         print("Invalid choice. Please select a valid choice from below menu")
111         main()
112
113 if __name__ == '__main__':
114     main()
```

Output: 1.

```
PS C:\Users\Sudeep\OneDrive - RAJDHANI COLLEGE\Desktop\DSA> & C:/Users/Sudeep/AppData/Local/Microsoft/WindowsApps/python3.11.exe "c:/Users/Suc
DSA/1.py"
SET Operations Menu

1. Check membership
2. Power set
3. Check subset
4. Union
5. Intersection
6. Complement
7. Set difference
8. Symmetric difference
9. Cartesian product

Enter your choice: 1

Type the elements separated by comma

Enter elements for set 1: a,b,1,2
Enter elements for set 2: 1,2,5

SET 1: {a, b, 1, 2}
SET 2: {1, 2, 5}
Enter the element to check membership: 2
Is 2 a member of set 1? True
Is 2 a member of set 2? True
```

2.

```
PS C:\Users\Sudeep\OneDrive - RAJDHANI COLLEGE\Desktop\DSA> & C:/Users/Sudeep/AppData/Local/Microsoft/WindowsApps/python3.11.exe "c:/Users/Sud
DSA/1.py"
SET Operations Menu

1. Check membership
2. Power set
3. Check subset
4. Union
5. Intersection
6. Complement
7. Set difference
8. Symmetric difference
9. Cartesian product

Enter your choice: 2

Type the elements separated by comma

Enter elements for set 1: 2,4,a
Enter elements for set 2: 3,5

SET 1: {2, 4, a}
SET 2: {3, 5}
Power set of set 1: [[], ['2'], ['4'], ['2', '4'], ['a'], ['2', 'a'], ['4', 'a'], ['2', '4', 'a']]
Power set of set 2: [[], ['3'], ['5'], ['3', '5']]
```

3.

```
PS C:\Users\Sudeep\OneDrive - RAJDHANI COLLEGE\Desktop\DSA> & C:/Users/Sudeep/AppData/Local/Microsoft/WindowsApps/python3.11.exe "c:/Users/Su
DSA/1.py"
SET Operations Menu

1. Check membership
2. Power set
3. Check subset
4. Union
5. Intersection
6. Complement
7. Set difference
8. Symmetric difference
9. Cartesian product

Enter your choice: 3

Type the elements separated by comma

Enter elements for set 1: 1,2,3
Enter elements for set 2: 1,2,3,4,5,6

SET 1: {1, 2, 3}
SET 2: {1, 2, 3, 4, 5, 6}
Is set 1 a subset of set 2? True
Is set 2 a subset of set 1? False
```

4.

```
DSA/1.py"rs\Sudeep\OneDrive - RAJDHANI COLLEGE\Desktop\DSA>
SET Operations Menu

1. Check membership
2. Power set
3. Check subset
4. Union
5. Intersection
6. Complement
7. Set difference
8. Symmetric difference
9. Cartesian product

Enter your choice: 4

Type the elements separated by comma

Enter elements for set 1: apple, mango
Enter elements for set 2: banana, orange

SET 1: {apple,  mango}
SET 2: {banana,  orange}
Union of set 1 and set 2: {'apple', ' orange', ' mango', 'banana'}
```

5.

```
PS C:\Users\Sudeep\OneDrive - RAJDHANI COLLEGE\Desktop\DSA> & C:/Users/Sudeep/AppData/Local/Microsoft/WindowsApps/python3.11.exe "c:/Users/Su
DSA/1.py"
SET Operations Menu

1. Check membership
2. Power set
3. Check subset
4. Union
5. Intersection
6. Complement
7. Set difference
8. Symmetric difference
9. Cartesian product

Enter your choice: 5

Type the elements separated by comma

Enter elements for set 1: sudeep,shubham,ankit
Enter elements for set 2: ankit,sudeep,gourav

SET 1: {sudeep, shubham, ankit}
SET 2: {ankit, sudeep, gourav}
Intersection of set 1 and set 2: {'sudeep', 'ankit'}
```

6.

```
SET Operations Menu

1. Check membership
2. Power set
3. Check subset
4. Union
5. Intersection
6. Complement
7. Set difference
8. Symmetric difference
9. Cartesian product

Enter your choice: 6

Type the elements separated by comma

Enter elements for set 1: 1,2,3,4,5,6,78,9
Enter elements for set 2: 2,3,4,5,6,7,89

SET 1: {1, 2, 3, 4, 5, 6, 78, 9}
SET 2: {2, 3, 4, 5, 6, 7, 89}
Enter elements for the universal set (comma-separated): 0,1,2,3,4,5,6,7,8,9,89,78,90,100
Complement of set 1: {'7', '89', '0', '8', '90', '100'}
Complement of set 2: {'78', '9', '100', '8', '90', '0', '1'}
```

7.

```
PS C:\Users\Sudeep\OneDrive - RAJDHANI COLLEGE\Desktop\DSA> & C:/Users/Sudeep/AppData/Local/Microsoft/WindowsApps/python3.11.exe "c:/Users/Sud
DSA/1.py"
SET Operations Menu

1. Check membership
2. Power set
3. Check subset
4. Union
5. Intersection
6. Complement
7. Set difference
8. Symmetric difference
9. Cartesian product

Enter your choice: 7

Type the elements separated by comma

Enter elements for set 1: Ankit,Shubham, Sudeep,Gourav, Pawan
Enter elements for set 2: Ankit,Shubham, Rishi, Golu

SET 1: {Ankit, Shubham,  Sudeep, Gourav,  Pawan}
SET 2: {Ankit, Shubham,  Rishi,  Golu}
Difference of set 1 and set 2: {' Pawan', 'Gourav', ' Sudeep'}
Difference of set 2 and set 1: {' Golu', ' Rishi'}
```

8.

```
PS C:\Users\Sudeep\OneDrive - RAJDHANI COLLEGE\Desktop\DSA> & C:/Users/Sudeep/AppData/Local/Microsoft/WindowsApps/python3.11.exe "c:/Users/Sud
DSA/1.py"
SET Operations Menu

1. Check membership
2. Power set
3. Check subset
4. Union
5. Intersection
6. Complement
7. Set difference
8. Symmetric difference
9. Cartesian product

Enter your choice: 8

Type the elements separated by comma

Enter elements for set 1: Py, R, Cpp, js, html
Enter elements for set 2: css, html, js, go

SET 1: {Py,  R,  Cpp,  js,  html}
SET 2: {css,  html,  js,  go}
Symmetric difference of set 1 and set 2: {' Cpp', ' R', 'css', 'Py', ' go'}
```

9.

```
PS C:\Users\Sudeep\OneDrive - RAJDHANI COLLEGE\Desktop\DSA> & C:/Users/Sudeep/AppData/Local/Microsoft/WindowsApps/python3.11.exe "c:/Users/Sudeep/OneDrive - RAJDHANI COLL
DSA/1.py"
SET Operations Menu

1. Check membership
2. Power set
3. Check subset
4. Union
5. Intersection
6. Complement
7. Set difference
8. Symmetric difference
9. Cartesian product

Enter your choice: 9

Type the elements separated by comma

Enter elements for set 1: Orange, Apple, Pear
Enter elements for set 2: Orange, Green

SET 1: {Orange,  Apple,  Pear}
SET 2: {Orange,  Green}
Cartesian product of set 1 and set 2: [('Orange', 'Orange'), ('Orange', ' Green'), (' Apple', 'Orange'), (' Apple', ' Green'), (' Pear', 'Orange'), (' Pear', ' Green')]
```