Q: Implement Max-membership method and Mean-max membership method of defuzzifications. Your program should contain functions for both methods. The program should generate defuzzified value of the input fuzzy set for the above functions.

Solution:

Code available at:
https://colab.research.google.com/drive/1fqd4F0BvjVYISciTCCFFTHQsxeK8zVwq?usp=sharing

```
class FuzzySet:
    def __init__(self):
        self.elements = []
        self.memberships = []

    def add_element(self, element, membership):
        if membership < 0 or membership > 1:
            print("Invalid membership value. Membership value should be between 0 and 1.")
            again_membership = float(input(f"Enter membership value of {element} AGAIN! (between 0 and 1): "))
            self.elements.append(element)
            self.memberships.append(again_membership)
        else:
            self.elements.append(element)
            self.memberships.append(membership)

    def max_mem(self):
        max_index = self.memberships.index(max(self.memberships))
        max_value = self.elements[max_index]
```

```
        print("Deffuz of Set: ", max_value)

    def mean_max(self):
        combined = list(zip(self.elements, self.memberships))

        sorted_combined = sorted(combined, key=lambda x: x[0])

        sorted_element = [x[0] for x in sorted_combined]
        sorted_mem = [x[1] for x in sorted_combined]

        max_members = []
        max_membership = max(sorted_mem)
        for i in range(len(sorted_element)):
            if sorted_mem[i] == max_membership:
                max_members.append(sorted_element[i])

        if(len(max_members) > 1):
            mean_max_value = (float(max_members[0]) + float(max_members[-1])) / 2
        else:
            mean_max_value = max_members

        print("Deffuz of Set: ", mean_max_value)

    def print_set(self):
        for i in range(len(self.elements)):
            print(self.elements[i], self.memberships[i])

set1 = FuzzySet()
```

```
n = int(input("Enter the number of elements in set: "))

for i in range(n):
    element = input(f"Enter element {i+1} in set: ")
    membership = float(input(f"Enter membership value of {element} in set A (between 0 and 1): "))
    set1.add_element(element, membership)



print("\nSet:")
set1.print_set()

print("\nMax Membership:")
set1.max_mem()

print("\nMean-Max Membership:")
set1.mean_max()
```

Output

Enter the number of elements in set: 5

Enter element 1 in set: 9

Enter membership value of 9 in set A (between 0 and 1): 0.6

Enter element 2 in set: 6

Enter membership value of 6 in set A (between 0 and 1): 0.8

Enter element 3 in set: 5

Enter membership value of 5 in set A (between 0 and 1): 0.8

Enter element 4 in set: 7

Enter membership value of 7 in set A (between 0 and 1): 0.8

Enter element 5 in set: 3

Enter membership value of 3 in set A (between 0 and 1): 0.7

Set:

9 0.6

6 0.8

5 0.8

7 0.8

3 0.7

Max Membership:

Deffuz of Set: 6

Mean-Max Membership:

Deffuz of Set: 6.0