

Name:	Mehak Zafar
Registration No:	SP22-BCS-019

Lab Final:

#### QUESTION 1:

```
import skfuzzy as fuzz
import numpy as np

# cholesterol arrangement (range : 100 -- 300)
x_chol = np.arange(100, 300, 1)

# Membership functions
# trimf==> triangular membership function --> takes cholesterol, starting point, peak point, ending point
chol_low = fuzz.trimf(x_chol, [110, 130, 150])
chol_borderline = fuzz.trimf(x_chol, [140, 170, 200])
chol_high = fuzz.trimf(x_chol, [180, 220, 260])

# my roll number is 019
roll_no = 19
chol_value = (roll_no % 150) + 120
print("My Cholesterol value is --- ", chol_value)

# Membership degrees
# degrees==> giving degrees either it is low, high, borderline
chol_level_low = fuzz.interp_membership(x_chol, chol_low, chol_value)
chol_level_borderline = fuzz.interp_membership(x_chol, chol_borderline, chol_value)
chol_level_high = fuzz.interp_membership(x_chol, chol_high, chol_value)

# displaying values
print("Low Cholesterol value is --- ", chol_level_low)
print("Borderline Cholesterol value is --- ", chol_level_borderline)
print("High Cholesterol value is --- ", chol_level_high)

# if cholesterol level is high then risk is high, if low then risk low, similarly for border line

if chol_level_high > max(chol_level_low, chol_level_borderline):
    risk = "High"
elif chol_level_borderline > max(chol_level_low, chol_level_high):
    risk = "Medium"
else:
```

```

risk = "Low"

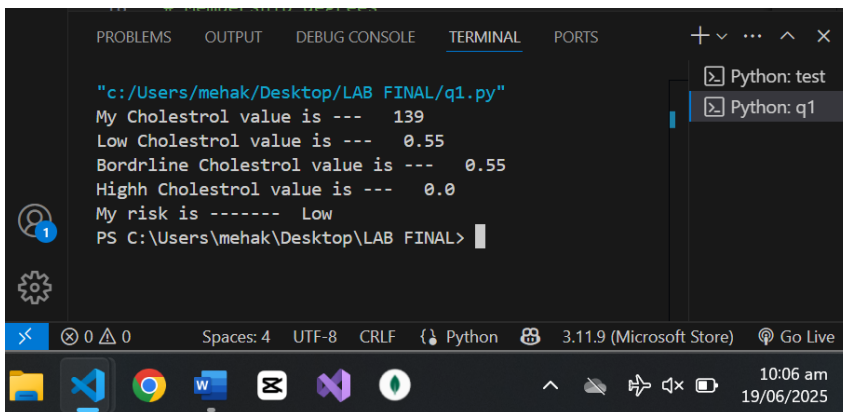
print("My risk is ----- ",risk)

import matplotlib.pyplot as plt

plt.figure(figsize=(7, 3))
# b means bluee, g -> green, r means --> redd
plt.plot(x_chol, chol_low, 'b', label='Low')
plt.plot(x_chol, chol_borderline, 'g', label='Borderline')
plt.plot(x_chol, chol_high, 'r', label='High')
plt.axvline(chol_value, color='k', linestyle='--', label=f'Value: {chol_value}')
plt.title('Cholestrol Memmbership Functions')
plt.xlabel('Cholestrol Level')
plt.ylabel('Membership Degrees')
plt.legend()
plt.grid(True)
plt.show()

```

Output:

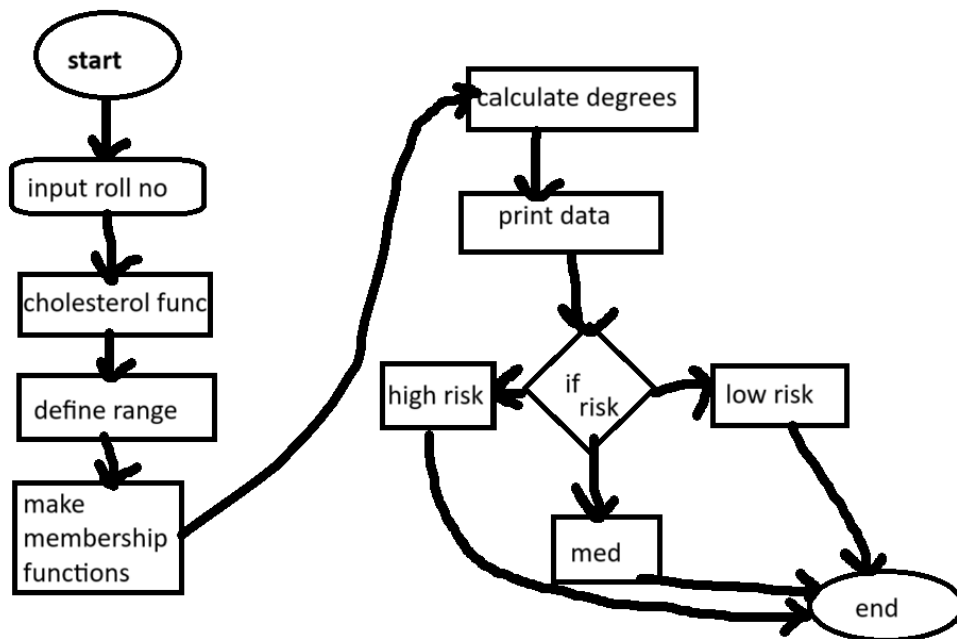
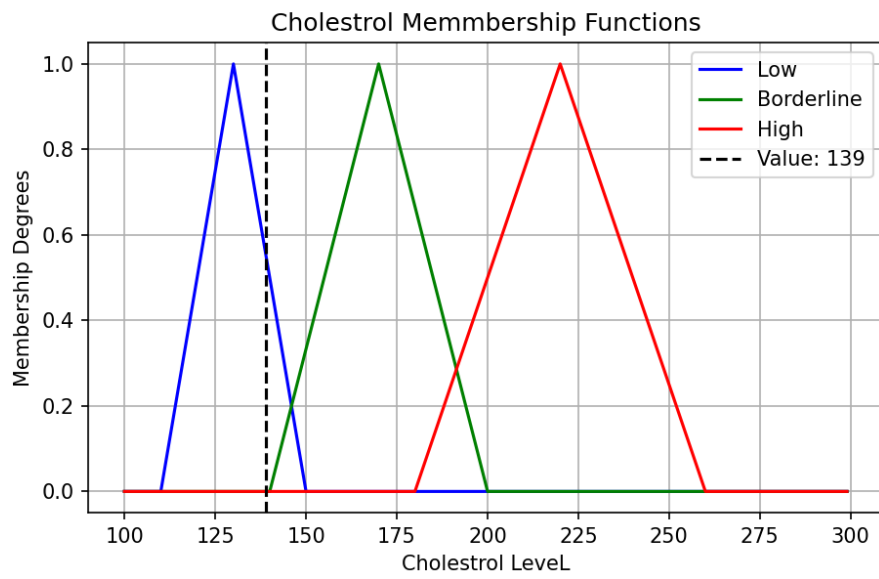


```

"c:/Users/mehak/Desktop/LAB FINAL/q1.py"
My Cholestrol value is --- 139
Low Cholestrol value is --- 0.55
Bordrline Cholestrol value is --- 0.55
Highh Cholestrol value is --- 0.0
My risk is ----- Low
PS C:\Users\mehak\Desktop\LAB FINAL>

```

Figure 1



## QUESTION 2:

```
patients = [
    [45, 130, 1],
    [30, 120, 0],
    [50, 140, 1],
    [28, 110, 0]
]

# input is given
age_weights = 0
bp_weights = 0
bias = 0

# Learning rate
learning_Rate = 0.3 #0.3 or 0.4

print("Initial weights: age =", age_weights, "bp =", bp_weights, "bias =", bias)

for idx, person in enumerate(patients):
    age = person[0]
    bp = person[1]
    label = person[2]

    # Calculate linear combination
    total = age_weights * age + bp_weights * bp + bias

    # Unit step function
    if total >= 0:
        prediction = 1
    else:
        prediction = 0

    # Update the rule
    # here we are calculating weights of age, bp, the input features of patients
    if prediction != label:
        age_weights = age_weights + learning_Rate * (label - prediction) * age
        bp_weights = bp_weights + learning_Rate * (label - prediction) * bp
        bias = bias + learning_Rate * (label - prediction)

    # displaying the data
    print("After patient ", idx+1, " : age_w=", age_weights, " bp_w= ", bp_weights, "bias=" ,bias)

print("Final weights: age =", age_weights, "bp =", bp_weights, "bias =", bias)
```

Output:

```
PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL  PORTS

Initial weights: age = 0 bp = 0 bias = 0
After patient 1 : age_w= 0 bp_w= 0 bias= 0
After patient 2 : age_w= -9.0 bp_w= -36.0 bias= -0.3
After patient 3 : age_w= 6.0 bp_w= 6.0 bias= 0.0
After patient 4 : age_w= -2.4000000000000004 bp_w= -27.0 bias= -0.3
Final weights: age = -2.4000000000000004 bp = -27.0 bias = -0.3
PS C:\Users\mehak\Desktop\LAB FINAL>
```

