APPLIED ARTIFICIAL INTELLIGENCE

EXPERIMENT – 04

```python
import numpy as np

import skfuzzy as fuzz

from skfuzzy import control as ctrl


# 1. Define fuzzy variables

temperature = ctrl.Antecedent(np.arange(0, 41, 1), 'temperature')  # 0 to 40 °C

heating_power = ctrl.Consequent(np.arange(0, 101, 1), 'heating_power')  # 0% to 100%


# 2. Define membership functions for temperature

temperature['cold'] = fuzz.trimf(temperature.universe, [0, 0, 10])

temperature['warm'] = fuzz.trimf(temperature.universe, [10, 15, 22])

temperature['hot'] = fuzz.trimf(temperature.universe, [20, 30, 40])


# 3. Define membership functions for heating power

heating_power['low'] = fuzz.trimf(heating_power.universe, [0, 0, 30])

heating_power['medium'] = fuzz.trimf(heating_power.universe, [25, 30, 55])

heating_power['high'] = fuzz.trimf(heating_power.universe, [50, 70, 90])


# 4. Define fuzzy rules

rule1 = ctrl.Rule(temperature['cold'], heating_power['high'])

rule2 = ctrl.Rule(temperature['warm'], heating_power['medium'])

rule3 = ctrl.Rule(temperature['hot'], heating_power['low'])


# 5. Create control system

heating_ctrl = ctrl.ControlSystem([rule1, rule2, rule3])

heating_simulation = ctrl.ControlSystemSimulation(heating_ctrl)


# 6. Input current temperature

current_temp = float(input("Enter current temperature (°C): "))

if current_temp < temperature.universe[0] or current_temp > temperature.universe[-1]:
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print(f"Temperature {current_temp}°C is out of range ({temperature.universe[0]}–{temperature.universe[-1]}°C). Please enter a value within range.")

else:

heating_simulation.input['temperature'] = current_temp

7. Compute output

heating_simulation.compute()

8. Output result

print(f"Recommended heating power: {heating_simulation.output['heating_power']:.2f}%")

output:

```
Enter current temperature (°C): 36
Recommended heating power: 12.25%

>
```