04. Write the program for define membership functions for heating power.

PROGRAM:

```
import numpy as np
import skfuzzy as fuzz
from skfuzzy import control as ctrl

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%

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])

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])

rule1 = ctrl.Rule(temperature['cold'], heating_power['high'])
rule2 = ctrl.Rule(temperature['warm'], heating_power['medium'])
rule3 = ctrl.Rule(temperature['hot'], heating_power['low'])

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

current_temp = float(input("Enter current temperature (°C): "))
heating_simulation.input['temperature'] = current_temp

heating_simulation.compute()

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

OUTPUT:

```
Enter current temperature (°C):  30
Recommended heating power: 10.00%
```