Problem 1: Smart Home Temperature Control System

Objective: Design a knowledge base and rules for a temperature control system in a smart home environment to maintain optimal temperature based on different conditions.

Description: Create a Prolog program that manages the temperature in a smart home. The system should control heating or cooling based on the current temperature, time of day, and whether the home is occupied.

Requirements:

Define facts for:

current_temperature(X) - the current room temperature.

desired_temperature(X) - the preferred room temperature.

time_of_day(morning/afternoon/evening/night).

home_occupied(yes/no) - whether someone is currently in the home.

Define rules to adjust the temperature, such as:

If home_occupied(yes), adjust to the desired_temperature.

If home_occupied(no) and it's night, reduce heating or cooling to save energy.

If the temperature is outside a comfort range (e.g., 18-24°C) and the home is occupied, activate heating or cooling.

Define an action output rule:

activate_heating or activate_cooling based on the current vs. desired temperature.

Example Queries:

?- activate_heating. or ?- activate_cooling. to determine if the system should activate heating or cooling.

?- current_temperature(30), desired_temperature(22), home_occupied(yes). should prompt cooling if it exceeds the desired range.

Problem 2: Medical Diagnosis System for Common Diseases

Objective: Build a simple diagnostic expert system for common diseases based on symptoms.

Description: Create a Prolog program that serves as an expert system to diagnose a list of common diseases based on a user's symptoms. The system will suggest possible diseases based on input symptoms.

Requirements:

Define facts for diseases and their associated symptoms:

disease(cold)., disease(flu)., disease(covid_19).

Symptoms such as fever, cough, sore_throat, fatigue, shortness_of_breath, body_aches.

Create rules to diagnose each disease based on symptoms:

Cold: cough, sore_throat, no fever.

Flu: fever, cough, body_aches, fatigue.

COVID-19: fever, cough, fatigue, shortness_of_breath.

Define a rule to match symptoms to diseases:

For example, has_disease(X) :- symptom_list_matches(X, List).

Example Queries:

?- has_disease(Disease). to identify potential diseases based on symptoms input.

Input symptoms to test diagnoses, e.g., ?- symptom(fever), symptom(cough), symptom(fatigue), has_disease(Disease).