

**Ex No: 2d**

## **IMPLEMENTATION OF FORWARD CHAINING**

### **Aim:**

To implement forward Chaining.

### **Scenario:**

A **diagnostic expert system** helps determine whether a patient has a disease based on **observed symptoms**. The system uses **forward chaining**, where it starts with known facts (symptoms) and applies rules to infer new facts until it reaches a conclusion (diagnosis).

### **Procedure:**

1. **Initialize a knowledge base containing IF-THEN rules.**
2. **Define the initial facts** (observed symptoms or given conditions).
3. **Repeat until no new facts are inferred:**
  - Iterate through each rule in the knowledge base.
  - Check if all conditions (IF part) of a rule exist in the known facts.
  - If true and the conclusion (THEN part) is **not already in facts**, add it to the facts.
  - Mark that a new fact was inferred and continue.
4. **Stop when no new facts are derived** in an iteration.
5. **Check if the final goal or diagnosis is in the inferred facts.**
6. **Output the conclusion** based on derived facts.

### **Program:**

# Knowledge Base: Rules in IF-THEN format

```
knowledge_base = [  
    ("cough", "fever", "flu"),  
    ("sore_throat", "runny_nose", "cold"),  
    ("sore_throat", "fever") # Sore throat can lead to fever  
]
```

# Given initial facts

```
facts = {"cough", "sore_throat"}
```

# Forward Chaining Function

```
def forward_chaining():
```

```
inferred = True # Keep looping as long as new facts are added
while inferred:
    inferred = False # Stop if no new fact is added in an iteration

    for conditions, conclusion in knowledge_base:
        if all(condition in facts for condition in conditions) and conclusion not in facts:
            facts.add(conclusion) # Add the inferred fact
            inferred = True # Mark that we inferred a new fact

# Run forward chaining
forward_chaining()

# Check if flu or cold is inferred
if "flu" in facts:
    print("The patient is diagnosed with flu.")
elif "cold" in facts:
    print("The patient is diagnosed with cold.")
else:
    print("No conclusive diagnosis could be made.")
```

### Output:

```
The patient is diagnosed with flu.
```