# Recognition of Token

- Tokens – pattern
- Grammar – branching statement
- if, then, else, relop, id, number ← token name

- *Grammar for branching statement →*

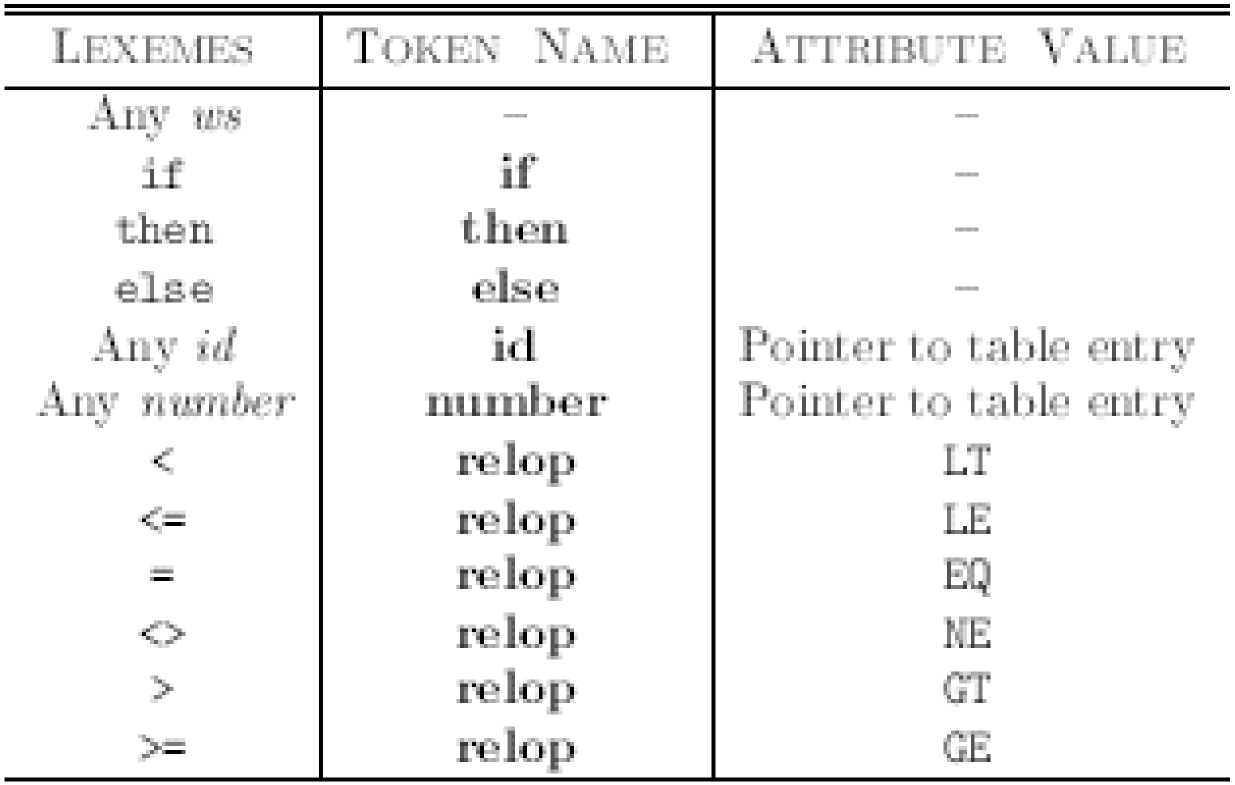
$$
\begin{array}{lcl}
stmt & \rightarrow & \textbf{if } expr \textbf{ then } stmt \\
 & | & \textbf{if } expr \textbf{ then } stmt \textbf{ else } stmt \\
 & | & \epsilon \\
expr & \rightarrow & term \textbf{ relop } term \\
 & | & term \\
term & \rightarrow & \textbf{id} \\
 & | & \textbf{number}
\end{array}
$$

- *Pattern of token*

$$
\begin{array}{rcl}
digit & \rightarrow & \texttt{[0-9]} \\
digits & \rightarrow & digit^{+} \\
number & \rightarrow & digits\ (\texttt{.}\ digits)?\ (\ \texttt{E}\ \texttt{[+-]}?\ digits\ )? \\
letter & \rightarrow & \texttt{[A-Za-z]} \\
id & \rightarrow & letter\ (\ letter \mid digit\ )^{*} \\
if & \rightarrow & \texttt{if} \\
then & \rightarrow & \texttt{then} \\
else & \rightarrow & \texttt{else} \\
relop & \rightarrow & \texttt{<} \mid \texttt{>} \mid \texttt{<=} \mid \texttt{>=} \mid \texttt{=} \mid \texttt{<>}
\end{array}
$$

- *Keyword →* *if, then, else*

# i. Tokens, patterns and attribute value



| LEXEMES | TOKEN NAME | ATTRIBUTE VALUE |
|---|---|---|
| Any *ws* | – | – |
| if | if | – |
| then | then | – |
| else | else | – |
| Any *id* | id | Pointer to table entry |
| Any *number* | number | Pointer to table entry |
| < | relop | LT |
| <= | relop | LE |
| = | relop | EQ |
| <> | relop | NE |
| > | relop | GT |
| >= | relop | GE |

# ii. Transition diagram

- Intermediate step – lexical analyzer
- Patterns → flowchart → Transition Diagram
- Transition Diagram
  - Accepting State
  - Retract forward pointer (* near accepting state))
  - Start state / initial state
  - States →circle
  - Actions → edges

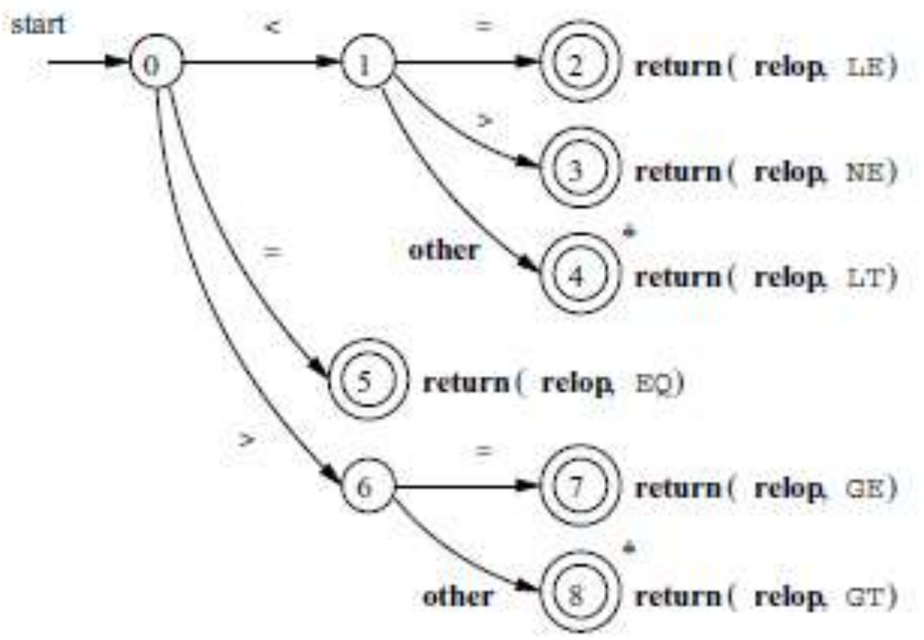


Figure 3.13: Transition diagram for **relop**

## iii. Recognition of Reserved words and Identifiers

- Keyword/identifier

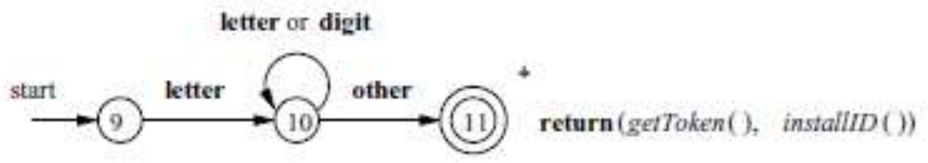


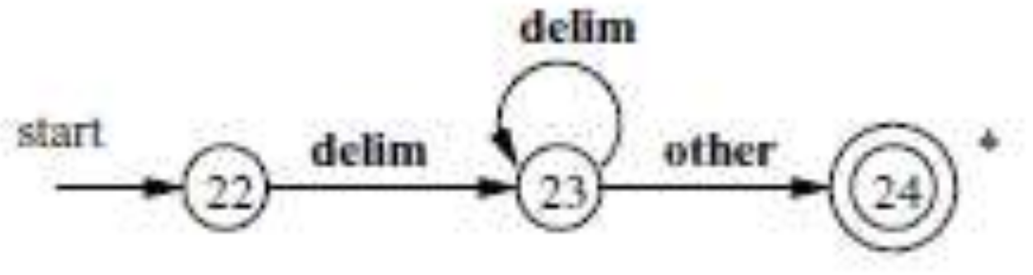
Figure 3.14: A transition diagram for **id**'s and keywords

- *Two ways to identify keyword:*
  1. Keyword – already –symbol table
  2. Transition diagram → identifier
     - Ex: then, thenextvalue
     - NUM

| | |
|---|---|
| if | Keyword |
| then | Keyword |
| else | Keyword |
| int | Keyword |
| NUM | ID,1 |
| thenextvalue | Id,2 |

# iv. Transition diagram for white space

- Ws →White spaces → newline / tab / blank


start
delim
delim
other
22
23
24
*