1.The rules that must be followed when writing a program are called ____.

a.syntax

b.punctuation

c.key words

d.operators

syntax

2.A(n) ____ program translates a high-level language program into a separate machine language program.

a.assembler

b.compiler

c.translator

d.utility

compiler

3.The ____ translates an assembly language program to a machine language program.

a.assembler

b.compiler

c.translator

d.interpreter

assembler

4.A(n) ____ is a set of instructions that a computer follows to perform a task.

a.compiler

b.program

c.interpreter

d.programming language

program

5.Which of the following error can a compiler check?

a. Syntax Error

b. Logical Error

c. Both Logical and Syntax Error

d. Compiler cannot check errors

Syntax Error

6.Which of the following phase of the compiler is Syntax Analysis?

a. Second

b. Third

c. First

d. All of the mentioned

Second

---

1. compilers are translators. (**true)**

2.rules of CFG are mostly not recursive. **(false)**

3.syntax of a language is specified by a CFG. **(true)**

4.A lexical analyzer checks whether a given program satisfies the rules implied by a CFG or not. **(false)**

5.For simplicity, a token may have a single attribute which holds the required information for that token. **(true)**

6. Sentence and word are also used in terms of string. **(true)**

7. We can give names to regular expressions, and we can use these names as symbols to define other regular expressions. **(true)**

8.we may use a deterministic or non-deterministic automaton as a lexical analyzer. **(true)**

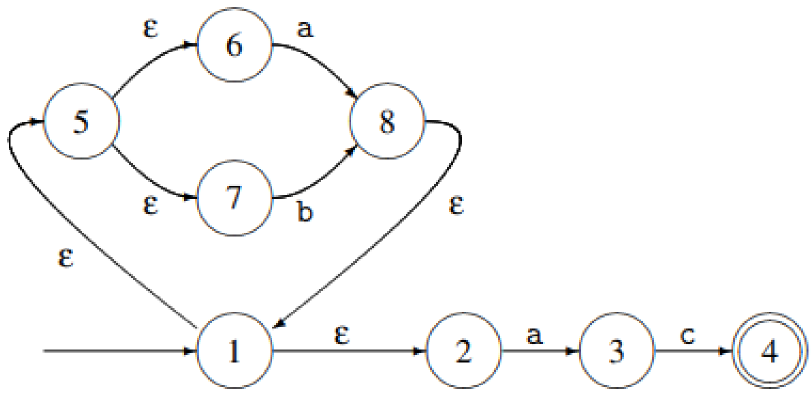
9.Both deterministic and non-deterministic finite automaton recognize regular sets. **(true)**

10.Epsilon- transitions are allowed in NFAs. In other words, we can move from one state to another one without consuming any symbol. **(true)**

11.We may convert a regular expression into a DFA (without creating a NFA first). **(true)**

12.in converting a NFA to DFA, the start state of DFA is epsilon-closure ({s0}). **(true)**

Convert From NFA to DFA:



Ans:

$$
\begin{aligned}
move(s'_0, \mathtt{a}) &= \varepsilon\text{-}closure(\{t \mid s \in \{1,2,5,6,7\} \text{ and } s^{\mathtt{a}}t \in T\}) \\
&= \varepsilon\text{-}closure(\{3,8\}) \\
&= \{3,8,1,2,5,6,7\} \\
&= s'_1
\end{aligned}
$$

$$
\begin{aligned}
move(s'_0, \mathtt{b}) &= \varepsilon\text{-}closure(\{t \mid s \in \{1,2,5,6,7\} \text{ and } s^{\mathtt{b}}t \in T\}) \\
&= \varepsilon\text{-}closure(\{8\}) \\
&= \{8,1,2,5,6,7\} \\
&= s'_2
\end{aligned}
$$

$$
\begin{aligned}
move(s'_0, \mathtt{c}) &= \varepsilon\text{-}closure(\{t \mid s \in \{1,2,5,6,7\} \text{ and } s^{\mathtt{c}}t \in T\}) \\
&= \varepsilon\text{-}closure(\{\}) \\
&= \{\}
\end{aligned}
$$

$$
\begin{aligned}
move(s'_1, \mathtt{a}) &= \varepsilon\text{-}closure(\{t \mid s \in \{3,8,1,2,5,6,7\} \text{ and } s^{\mathtt{a}}t \in T\}) \\
&= \varepsilon\text{-}closure(\{3,8\}) \\
&= \{3,8,1,2,5,6,7\} \\
&= s'_1
\end{aligned}
$$

$$
\begin{aligned}
move(s'_1, \mathtt{b}) &= \varepsilon\text{-}closure(\{t \mid s \in \{3,8,1,2,5,6,7\} \text{ and } s^{\mathtt{b}}t \in T\}) \\
&= \varepsilon\text{-}closure(\{8\}) \\
&= \{8,1,2,5,6,7\} \\
&= s'_2
\end{aligned}
$$

$$
\begin{aligned}
move(s'_1, \mathtt{c}) &= \varepsilon\text{-}closure(\{t \mid s \in \{3,8,1,2,5,6,7\} \text{ and } s^{\mathtt{c}}t \in T\}) \\
&= \varepsilon\text{-}closure(\{4\}) \\
&= \{4\} \\
&= s'_3
\end{aligned}
$$

$$
\begin{aligned}
move(s'_2, \mathtt{a}) &= \varepsilon\text{-}closure(\{t \mid s \in \{8,1,2,5,6,7\} \text{ and } s^{\mathtt{a}}t \in T\}) \\
&= \varepsilon\text{-}closure(\{3,8\}) \\
&= \{3,8,1,2,5,6,7\} \\
&= s'_1
\end{aligned}
$$

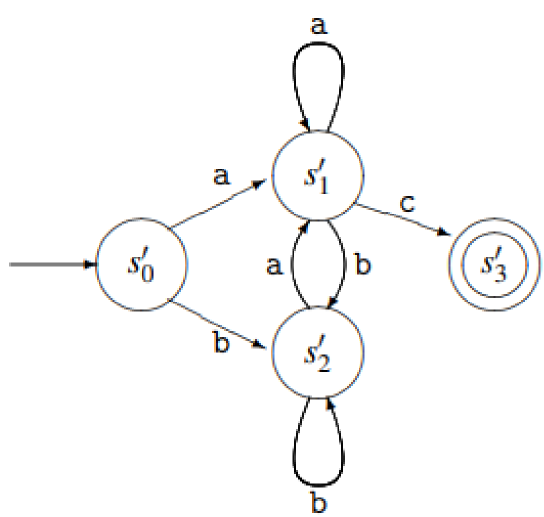
$$
\begin{aligned}
move(s'_2, \mathtt{b}) &= \varepsilon\text{-}closure(\{t \mid s \in \{8,1,2,5,6,7\} \text{ and } s^{\mathtt{b}}t \in T\}) \\
&= \varepsilon\text{-}closure(\{8\}) \\
&= \{8,1,2,5,6,7\} \\
&= s'_2
\end{aligned}
$$

$$
\begin{aligned}
move(s'_2, \mathtt{c}) &= \varepsilon\text{-}closure(\{t \mid s \in \{8,1,2,5,6,7\} \text{ and } s^{\mathtt{c}}t \in T\}) \\
&= \varepsilon\text{-}closure(\{\}) \\
&= \{\}
\end{aligned}
$$

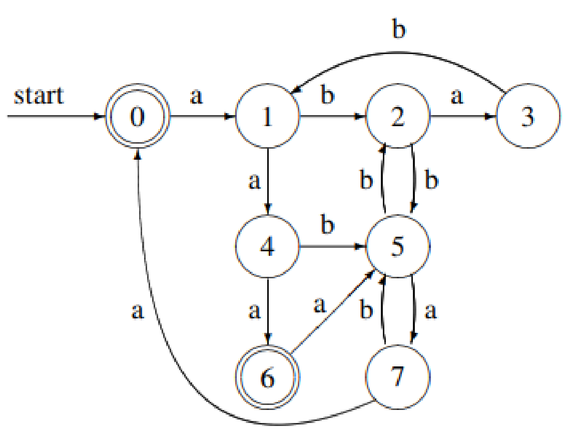
$$
\begin{aligned}
move(s'_3, \mathtt{a}) &= \varepsilon\text{-}closure(\{t \mid s \in \{4\} \text{ and } s^{\mathtt{a}}t \in T\}) \\
&= \varepsilon\text{-}closure(\{\}) \\
&= \{\}
\end{aligned}
$$

$$
\begin{aligned}
move(s'_3, \mathtt{b}) &= \varepsilon\text{-}closure(\{t \mid s \in \{4\} \text{ and } s^{\mathtt{b}}t \in T\}) \\
&= \varepsilon\text{-}closure(\{\}) \\
&= \{\}
\end{aligned}
$$

$$
\begin{aligned}
move(s'_3, \mathtt{c}) &= \varepsilon\text{-}closure(\{t \mid s \in \{4\} \text{ and } s^{\mathtt{c}}t \in T\}) \\
&= \varepsilon\text{-}closure(\{\}) \\
&= \{\}
\end{aligned}
$$



Minimize:



$$G_1 = \{0,6\}$$
$$G_2 = \{1,2,3,4,5,7\}$$

G_1	a	b
0	G_2	–
6	G_2	–

G_2	a	b
1	G_2	G_2
2	G_2	G_2
3	–	G_2
4	G_1	G_2
5	G_2	G_2
7	G_1	G_2

$$G_1 = \{0,6\}$$
$$G_3 = \{1,2,5\}$$
$$G_4 = \{3\}$$
$$G_5 = \{4,7\}$$

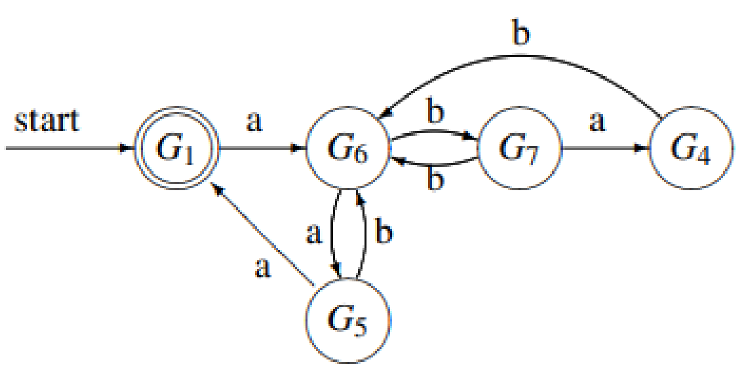
G_3	a	b
1	G_5	G_3
2	G_4	G_3
5	G_5	G_3

$$G_1 = \{0,6\}$$
$$G_4 = \{3\}$$
$$G_5 = \{4,7\}$$
$$G_6 = \{1,5\}$$
$$G_7 = \{2\}$$

G_5	a	b
4	G_1	G_6
7	G_1	G_6

G_6	a	b
1	G_5	G_7
5	G_5	G_7

G_1	a	b
0	G_6	–
6	G_6	–



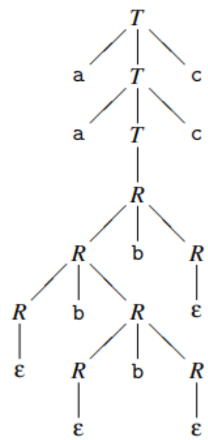
Prove:

$$
\begin{array}{lll}
T & \rightarrow & R \\
T & \rightarrow & \mathrm{a}T\mathrm{c} \\
R & \rightarrow & \\
R & \rightarrow & R\mathrm{b}R
\end{array}
$$

aabbbcc

Ans:

$$
\begin{array}{ll}
 & \underline{T} \\
\Rightarrow & \mathrm{a}\underline{T}\mathrm{c} \\
\Rightarrow & \mathrm{aa}\underline{T}\mathrm{cc} \\
\Rightarrow & \mathrm{aa}\underline{R}\mathrm{cc} \\
\Rightarrow & \mathrm{aa}\underline{R}\mathrm{b}R\mathrm{cc} \\
\Rightarrow & \mathrm{aa}\underline{R}\mathrm{b}R\mathrm{b}R\mathrm{cc} \\
\Rightarrow & \mathrm{aab}\underline{R}\mathrm{b}R\mathrm{cc} \\
\Rightarrow & \mathrm{aab}\underline{R}\mathrm{b}R\mathrm{b}R\mathrm{cc} \\
\Rightarrow & \mathrm{aabb}\underline{R}\mathrm{b}R\mathrm{cc} \\
\Rightarrow & \mathrm{aabbb}\underline{R}\mathrm{cc} \\
\Rightarrow & \mathrm{aabbbcc}
\end{array}
$$



Left Recursion:

$$
\begin{array}{lll}
E & \rightarrow & E + T \mid T \\
T & \rightarrow & T * F \mid F \\
F & \rightarrow & (E) \mid \mathbf{id}
\end{array}
$$

Ans:

$$
\begin{array}{lll}
E & \rightarrow & T\ E' \\
E' & \rightarrow & +\ T\ E' \mid \epsilon \\
T & \rightarrow & F\ T' \\
T' & \rightarrow & *\ F\ T' \mid \epsilon \\
F & \rightarrow & (E) \mid \mathbf{id}
\end{array}
$$

Eliminate Left Recursion:

$$
\begin{array}{l}
S \rightarrow A\ a \mid b \\
A \rightarrow A\ c \mid S\ d \mid \epsilon
\end{array}
$$

Ans:

$$A \rightarrow A\ c \mid A\ a\ d \mid b\ d \mid \epsilon$$

$$
\begin{array}{l}
S \rightarrow A\ a \mid b \\
A \rightarrow b\ d\ A' \mid A' \\
A' \rightarrow c\ A' \mid a\ d\ A' \mid \epsilon
\end{array}
$$