CS 419 Compiler

Project Form

Project Idea:

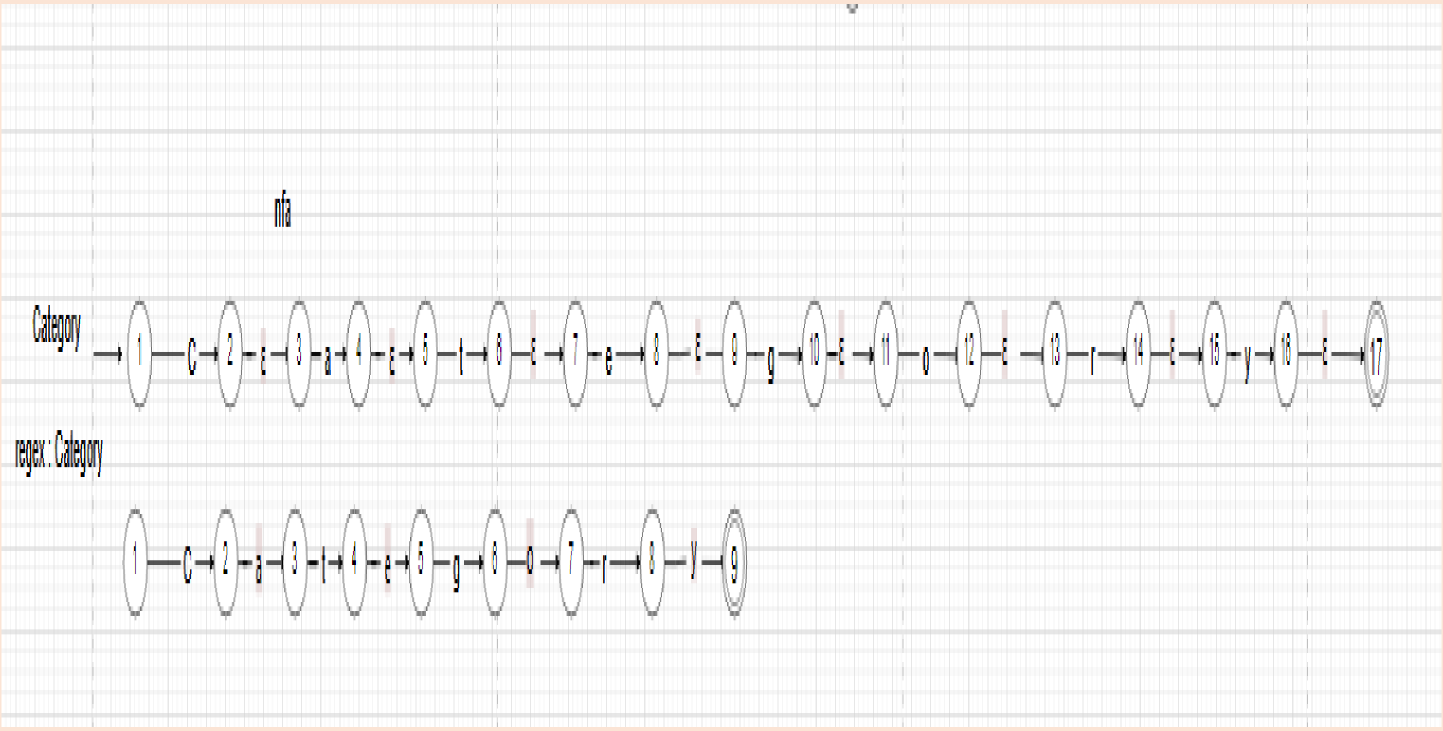
Project Idea #2

Team Members NO#: 7

ID	Name	Level& Department	Section(Day-from-to)	Role (Lead/Member)	Grade
201900754	محمود احمد صلاح علي				
201900728	محمد محمود الدمرداش لاشين				
20180441	كيرلس ميشيل سعيد عطاالله				
20150644	يوسف محمود محمد رجب				
20180436	كريم محمد يوسف شطا				
20160067	اسلام سيد صلاح				
20170409	محمد احمد عياد				

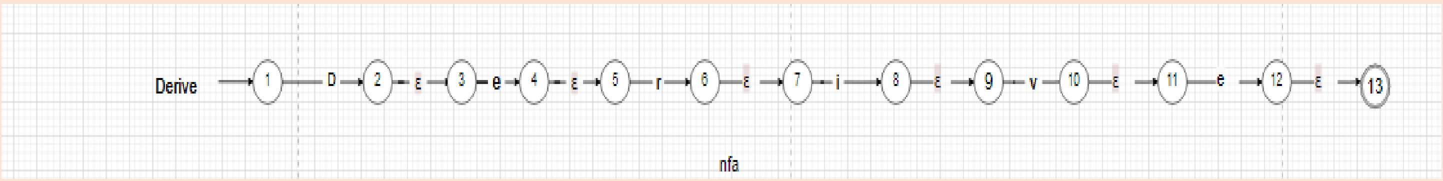
Regular Expression, Finite automata and Conversion from RegX to NFA, NFA to DFA

1-Category:

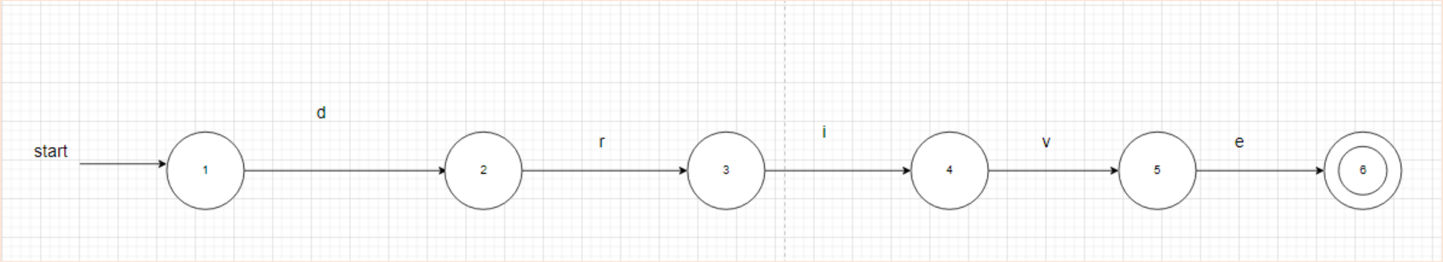

nfa
Category
1 C 2 ε 3 a 4 ε 5 t 6 ε 7 e 8 ε 9 g 10 ε 11 o 12 ε 13 r 14 ε 15 y 16 ε 17
regex : Category
1 C 2 a 3 t 4 e 5 g 6 o 7 r 8 y 9

2-Derive:

Nfa :

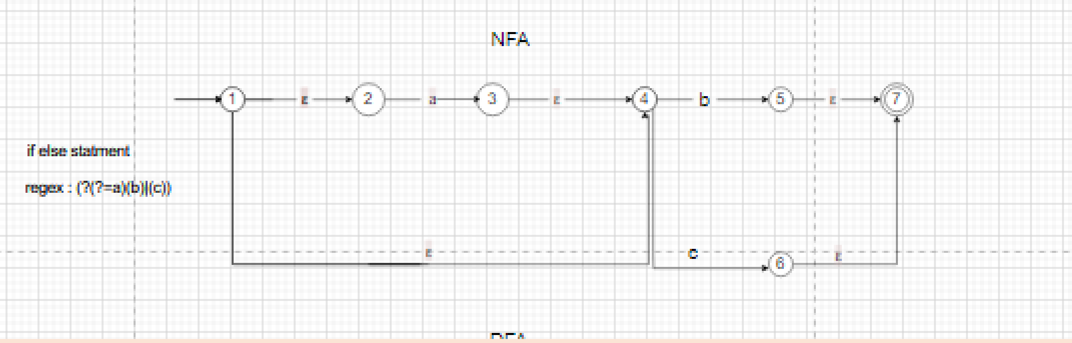


Dfa :

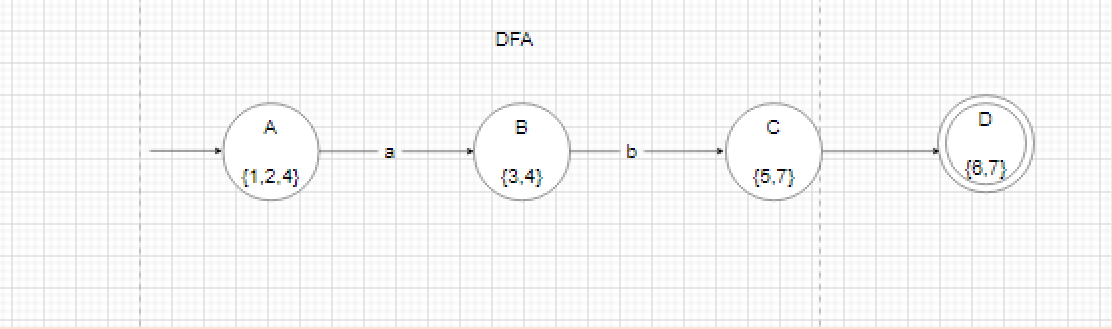


3-Else if:

Nfa:

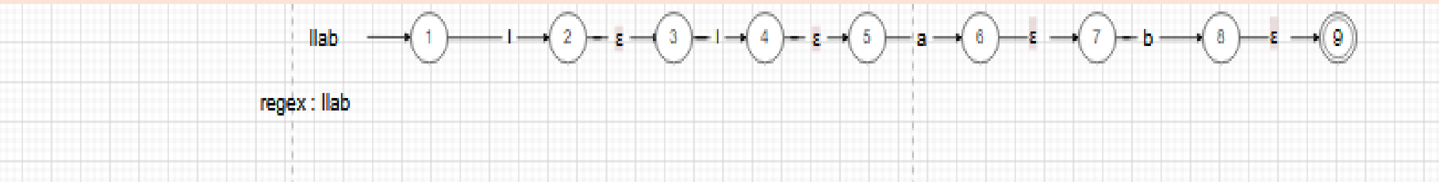


Dfa:

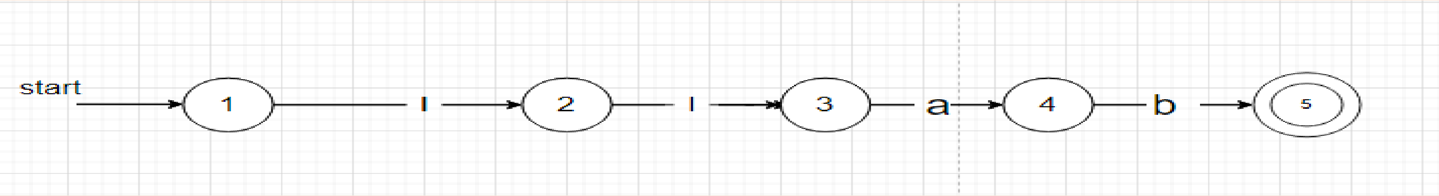


4-llap:

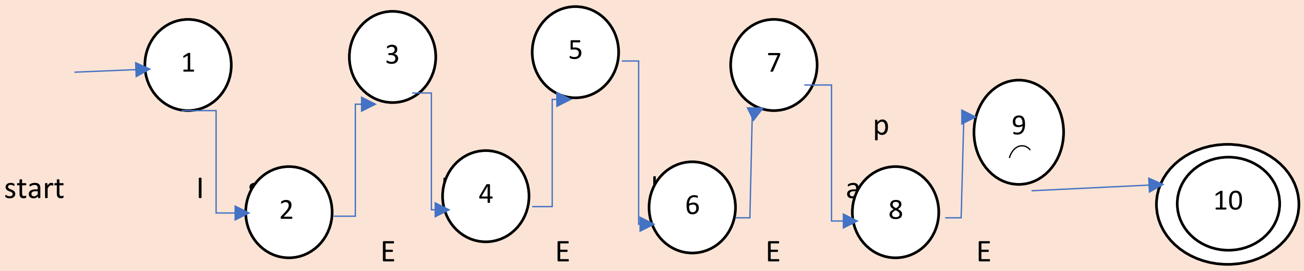
Nfa:



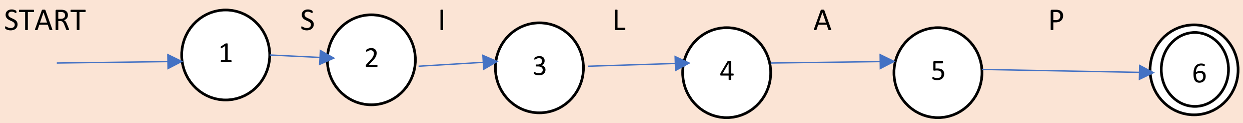
Dfa:



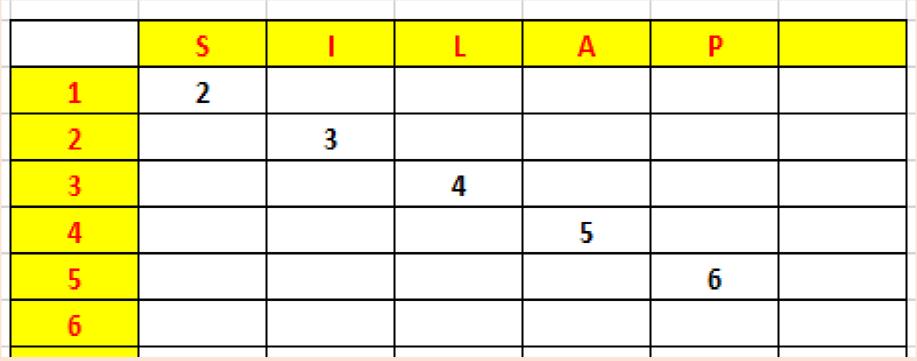
5-Silap:



D F A:



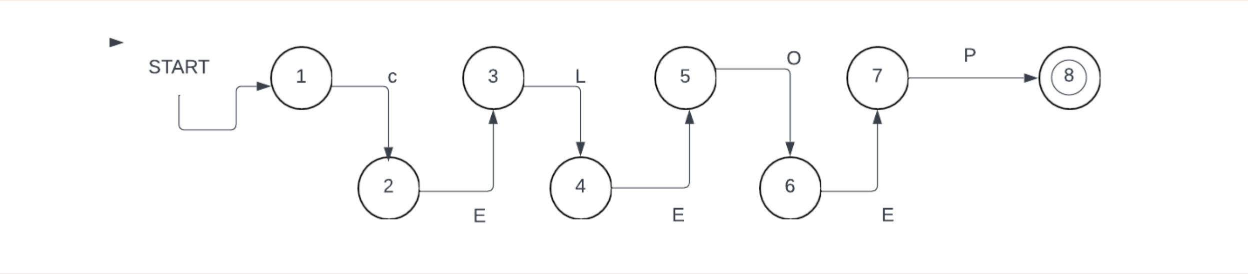
TRANSACTION TABLE:



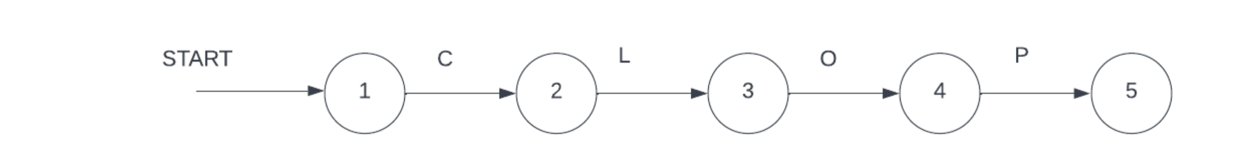
	S	I	L	A	P	
1	2					
2		3				
3			4			
4				5		
5					6	
6						

6-CLOP:

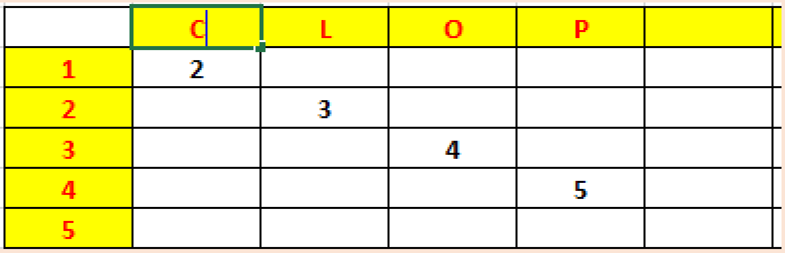
N F A:



D F A:



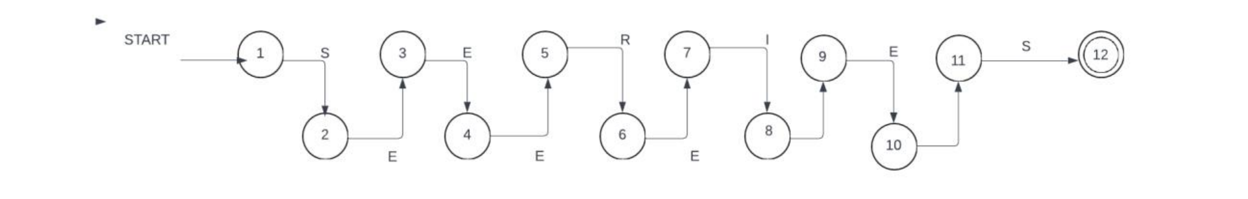
TRANZACTION TABLE:



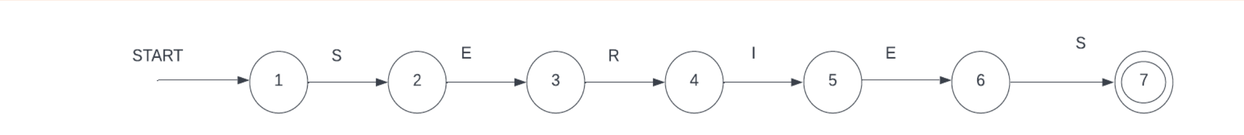
	C	L	O	P	
1	2				
2		3			
3			4		
4				5	
5					

7-SERIES:

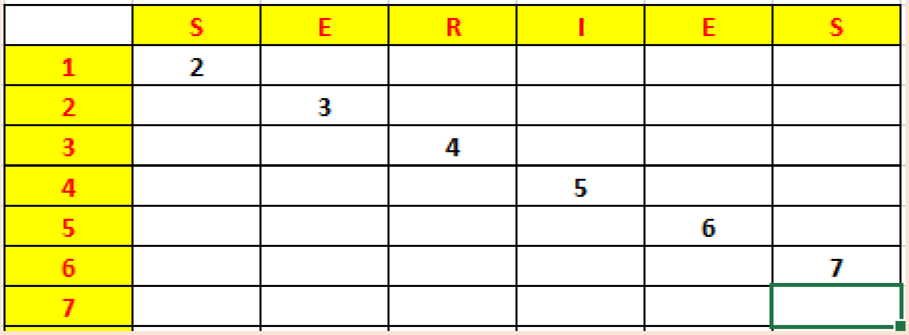
NFA :



DFA:



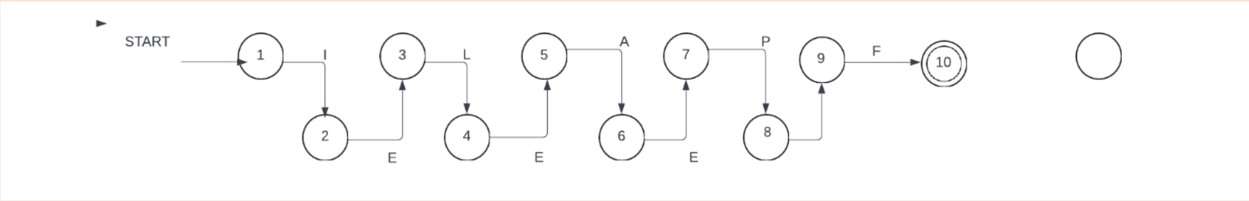
TRANSACTION TABLE:



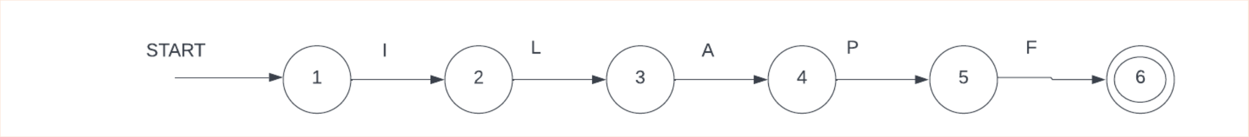
	S	E	R	I	E	S
1	2					
2		3				
3			4			
4				5		
5					6	
6						7
7						

8-ILAPF:

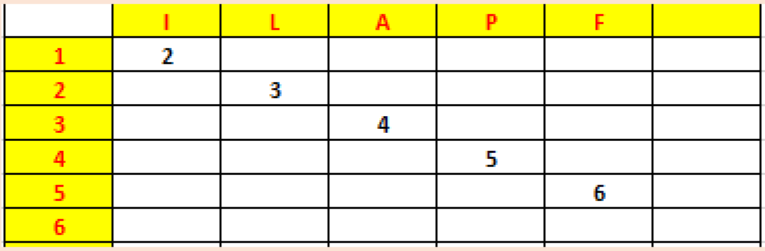
NFA:



DFA:



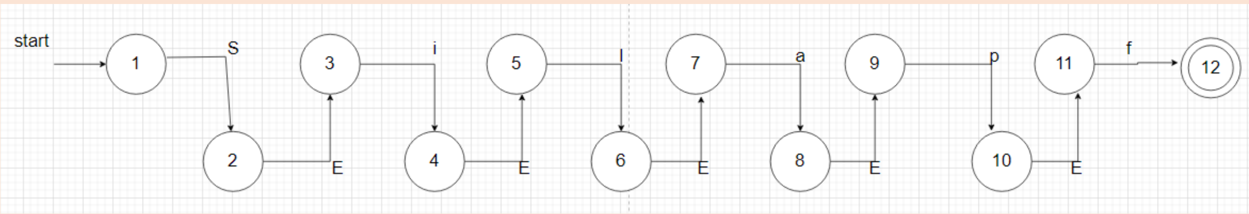
TRANZACTION TABLE:



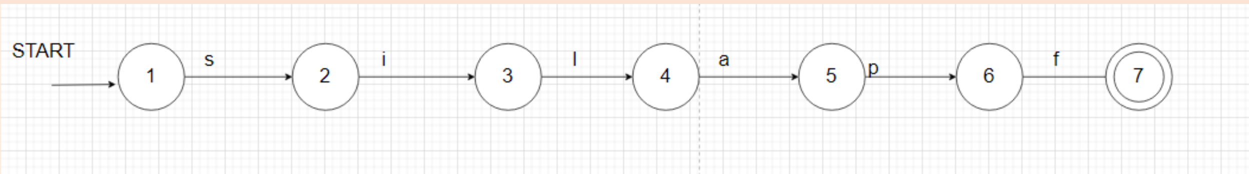
	I	L	A	P	F	
1	2					
2		3				
3			4			
4				5		
5					6	
6						

9-Silapf:

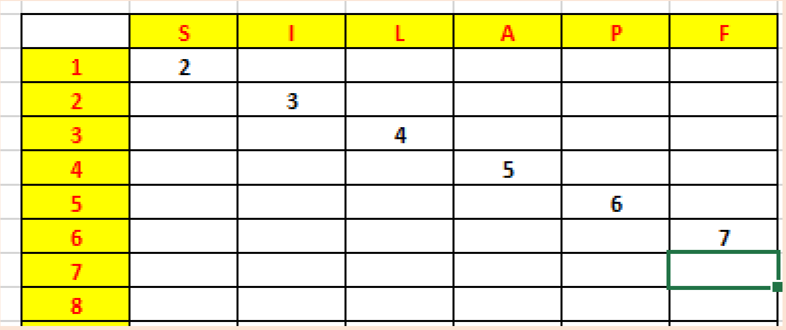
N F A :



D f a:



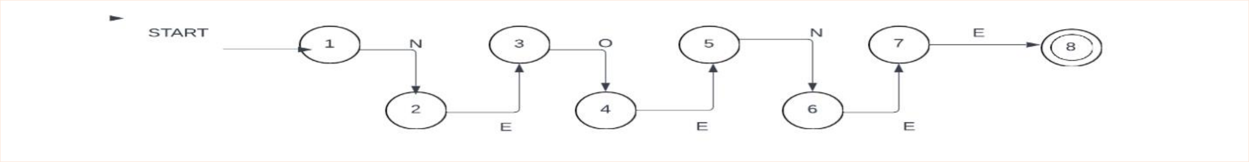
TRANSACTION TABLE :



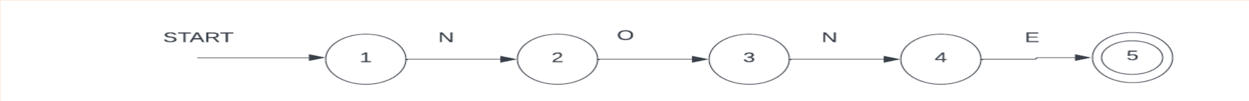
	S	I	L	A	P	F
1	2					
2		3				
3			4			
4				5		
5					6	
6						7
7						
8						

10-NONE:

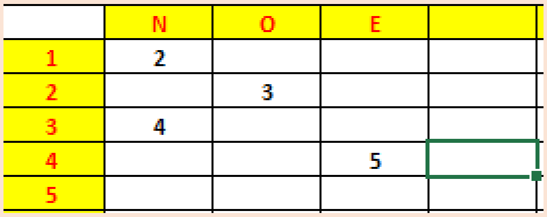
N F A



D F A:



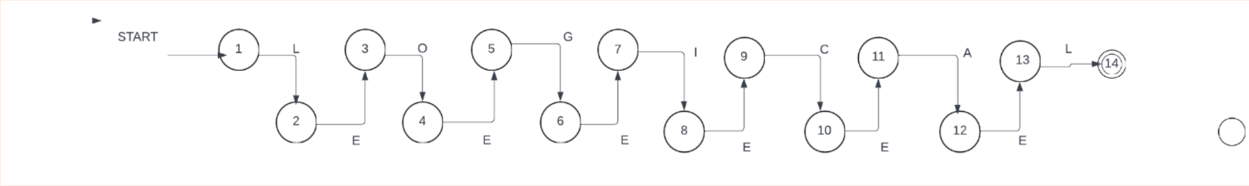
TRANZACTION TABLE :



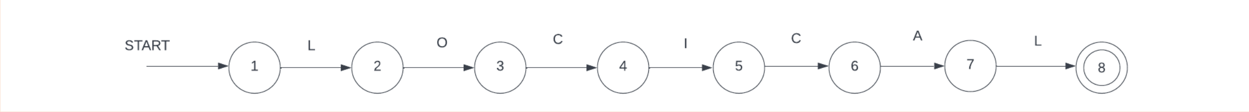
	N	O	E	
1	2			
2		3		
3	4			
4			5	
5				

11-LOGICAL:

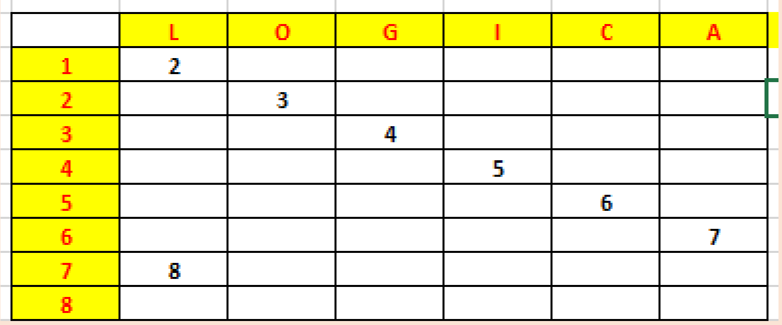
N F A:



D F A:

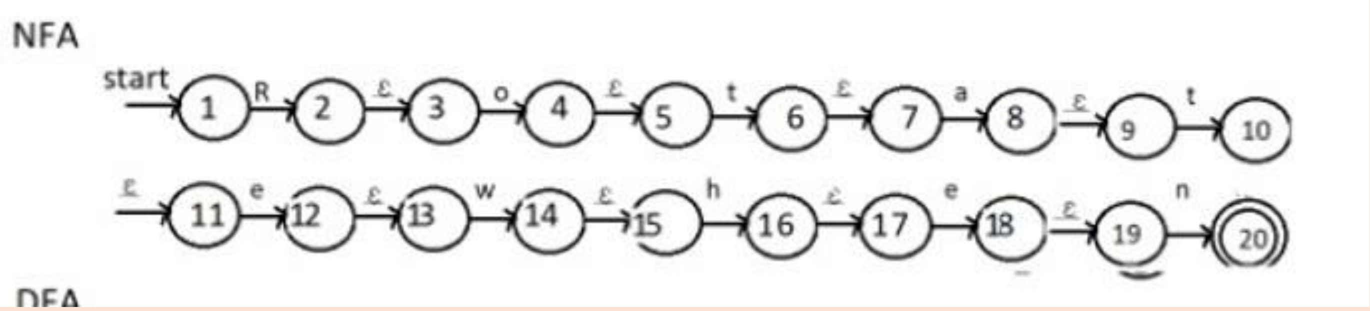


TRANSACTION TABLE :

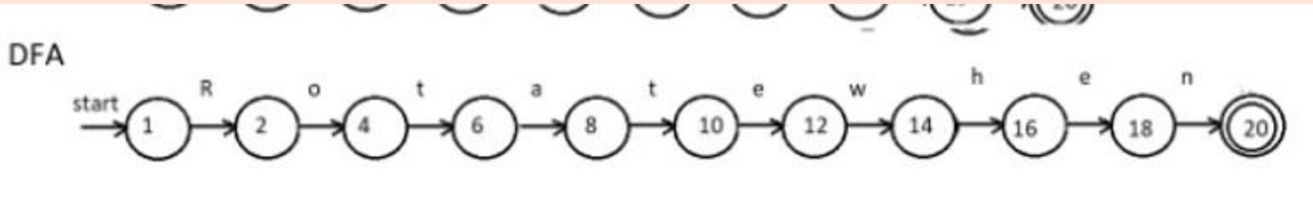


	L	O	G	I	C	A
1	2					
2		3				
3			4			
4				5		
5					6	
6						7
7	8					
8						

12-Rotatewhen:



D f a :

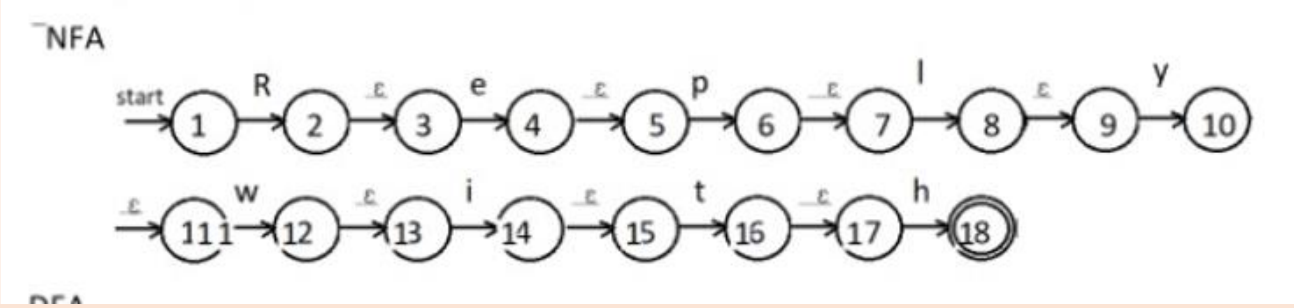


TRANSACTION TABLE :

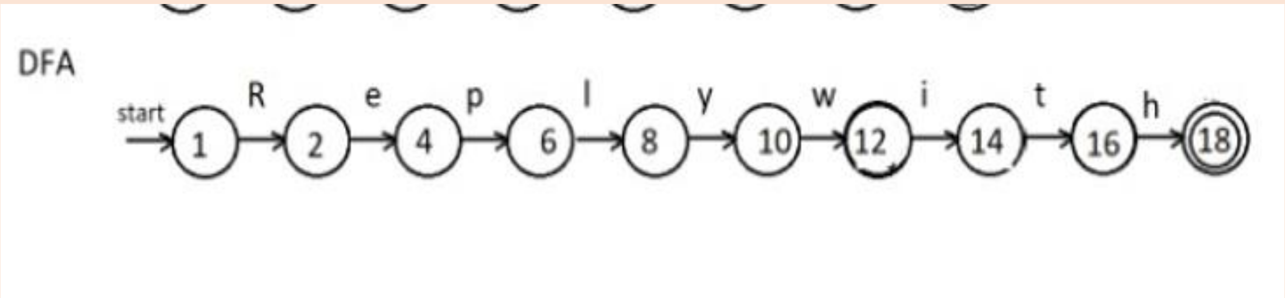
	R	o	t	a	t	e	w	h	e	n
1	2’									
2		4’								
4			6’							
6				8’						
8					10’					
10						12’				
12							14’			
14								16’		
16									18’	
18										20’
20										

12-Replywith:

N f a:



D f a:

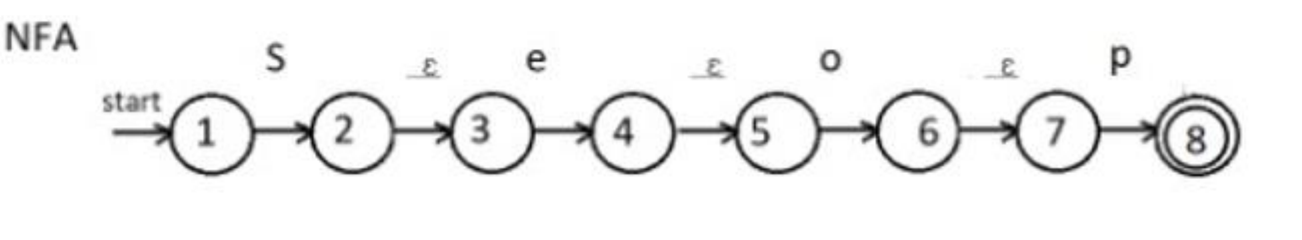


TRANSACTION TABLE :

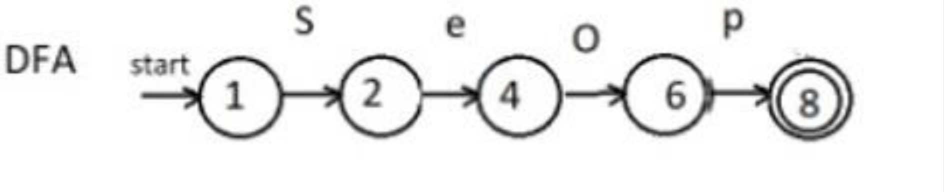
	R	e	p	l	y	w	i	t	h
1	2’								
2		4’							
4			6’						
6				8’					
8					10’				
10						12’			
12							14’		
14								16’	
16									18’
18									

13-Seop:

N f a:



D f a:

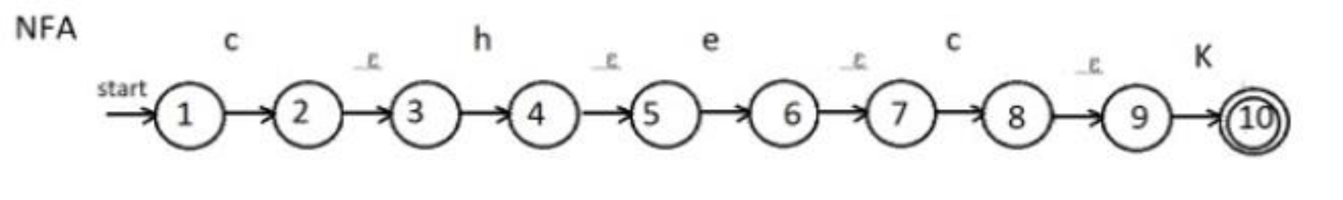


TRANSACTION TABLE :

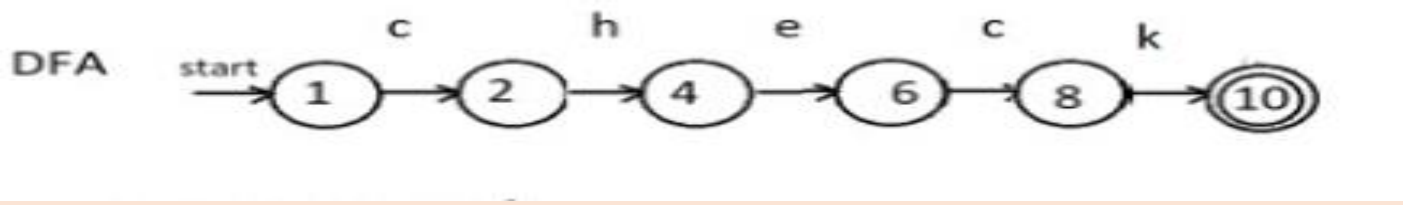
	S	e	o	p
1	2’			
2		4’		
4			6’	
6				8’
8				

14-Check:

N f a:



D f a:

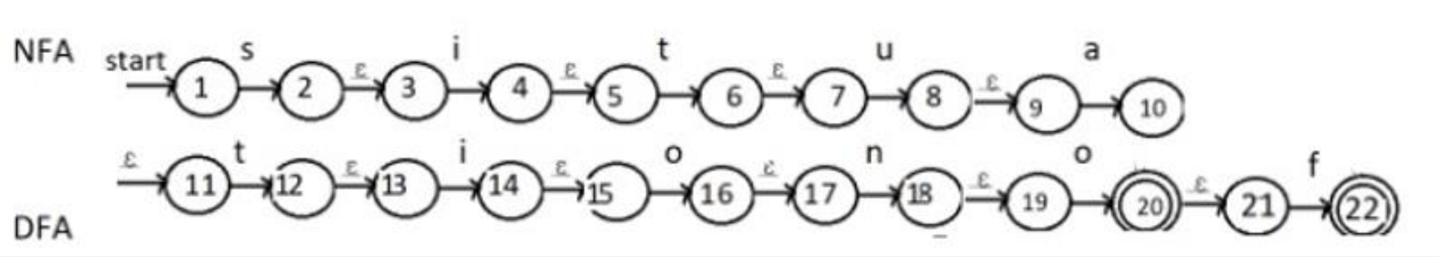


TRANSACTION TABLE :

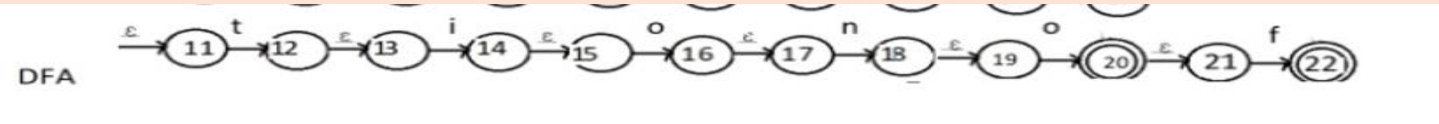
	C	h	e	c	k
1	2’				
2		4’			
4			6’		
6				8’	
8					10’
10					

15-Situationof:

N f a:



D f a:



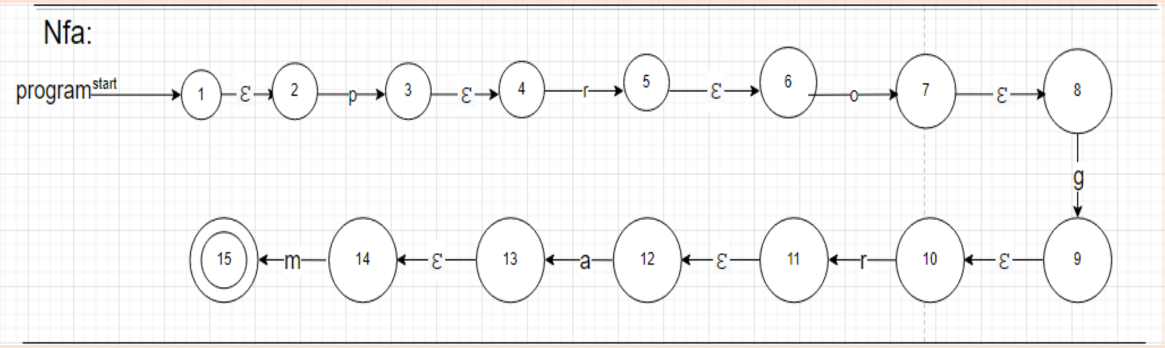
TRANSACTION TABLE :

	s	i	t	u	a	t	i	o	n	o	f
1	2’										
2		4’									
4			6’								
6				8’							
8					10’						
10						12’					
12							14’				
14								16’			
16									18’		
18										20’	
20											22’
22											

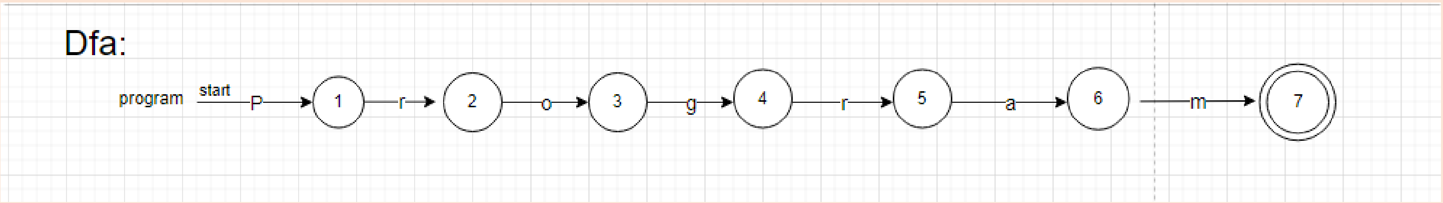
16-Program&End:

regex: program

N f a:



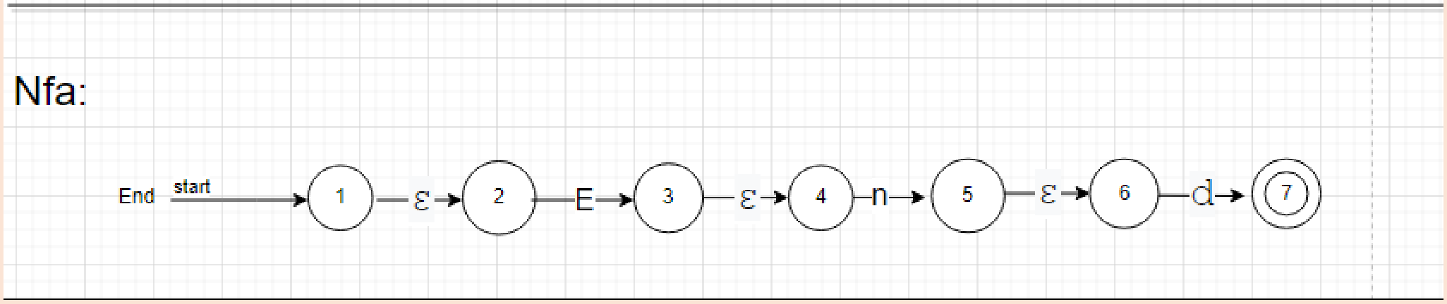
D f a:



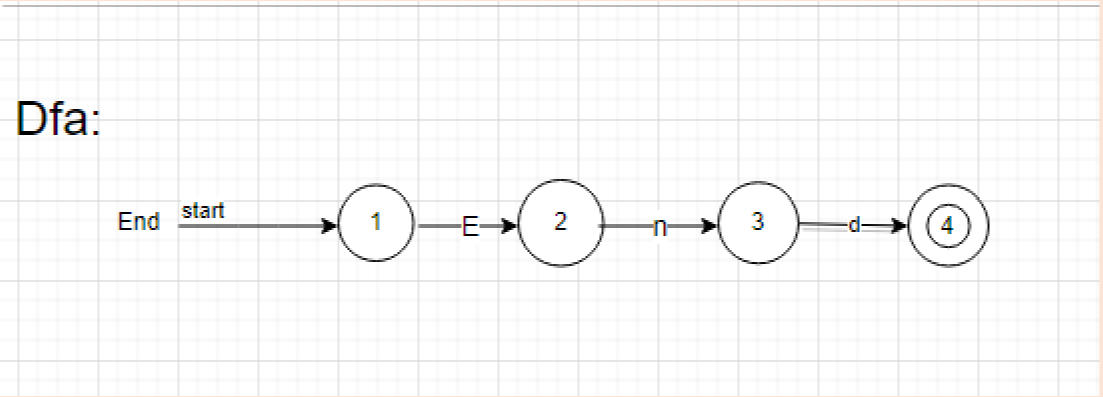
-END:

regex: End

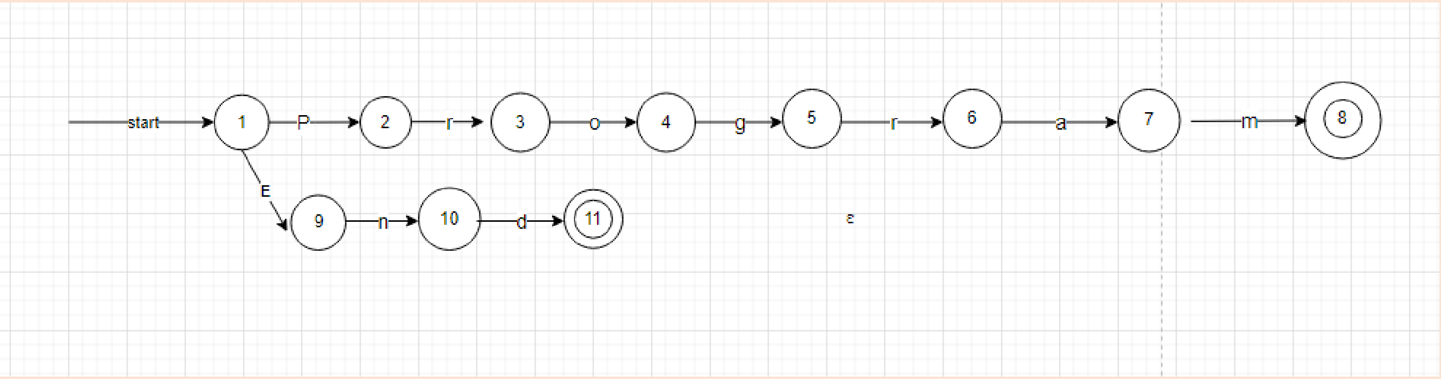
n f a:



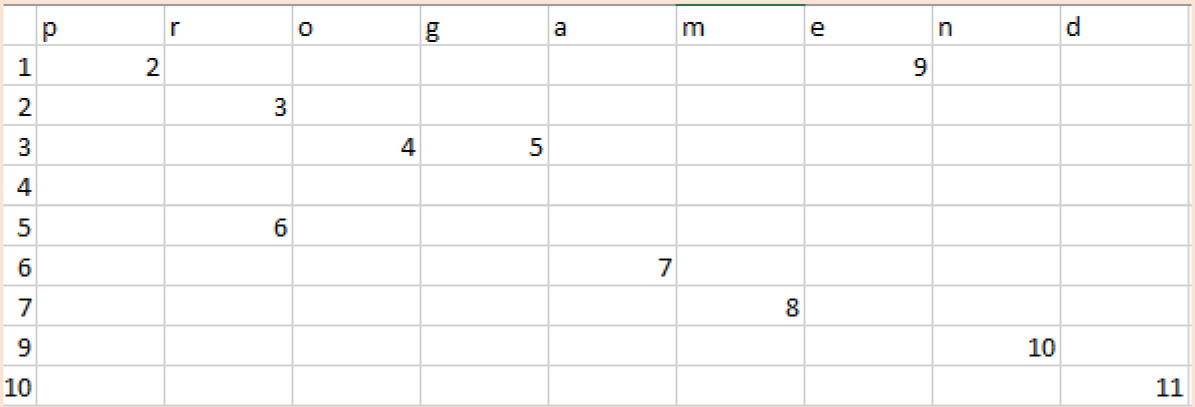
D f a:



DFA of Program&End:



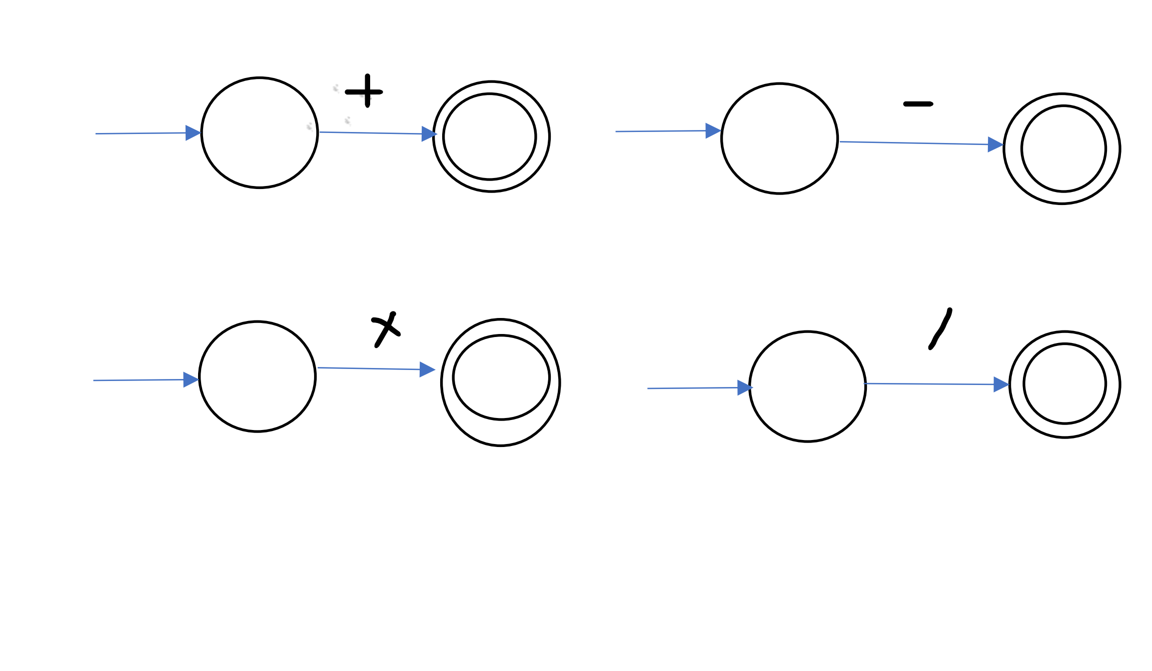
TRANSACTION TABLE :



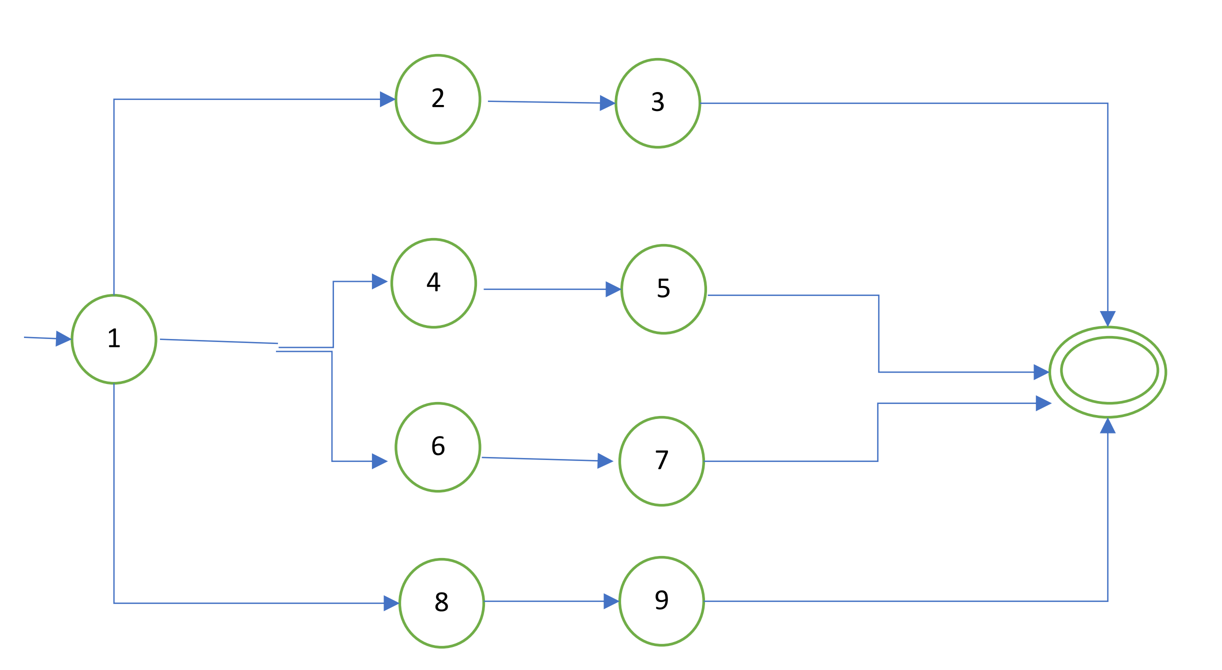
	p	r	o	g	a	m	e	n	d
1	2						9		
2		3							
3			4	5					
4									
5		6							
6					7				
7						8			
9								10	
10									11

18-Arithmetic Operation:

RE = + | - | * | /



N F A



TRANSACTION TABLE :

1? = {1,2,4,6,8}

2? = {2,3}

3? = {3}

4? = {4,5}

5? = {5}

6? = {6,7}

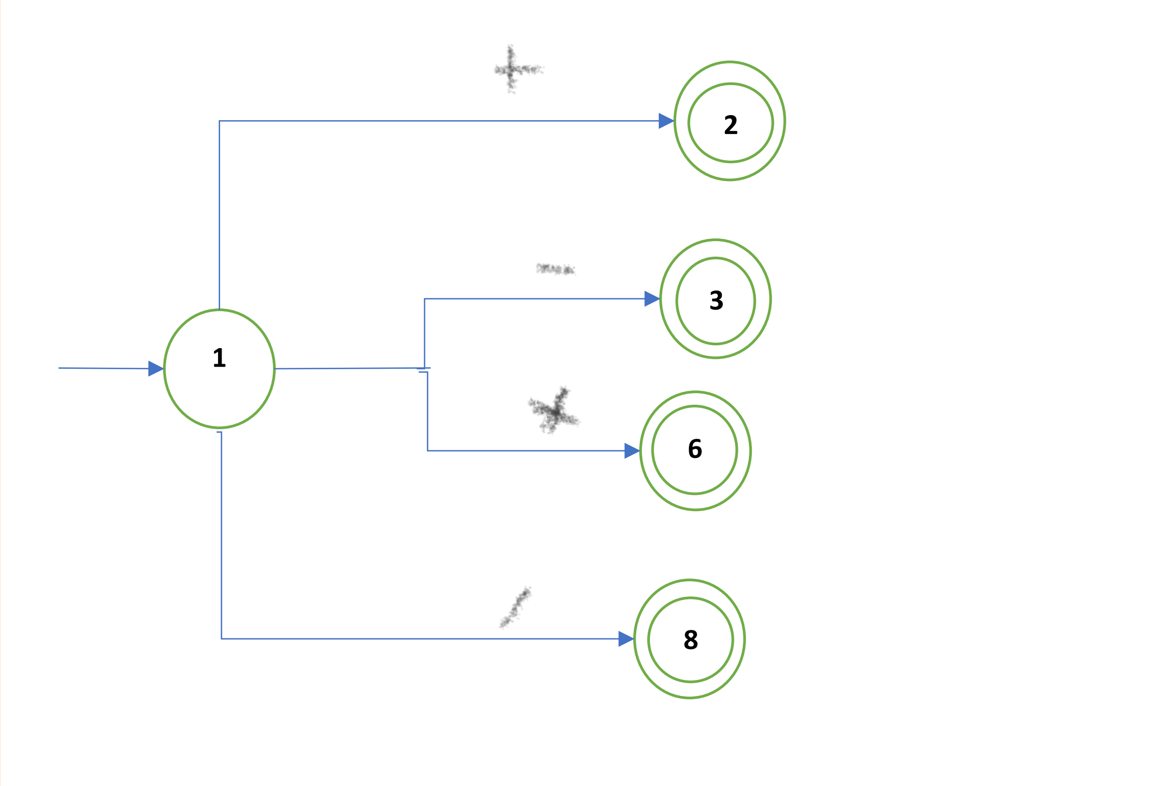
7? = {7}

8? = {8,9}

9? = {9}

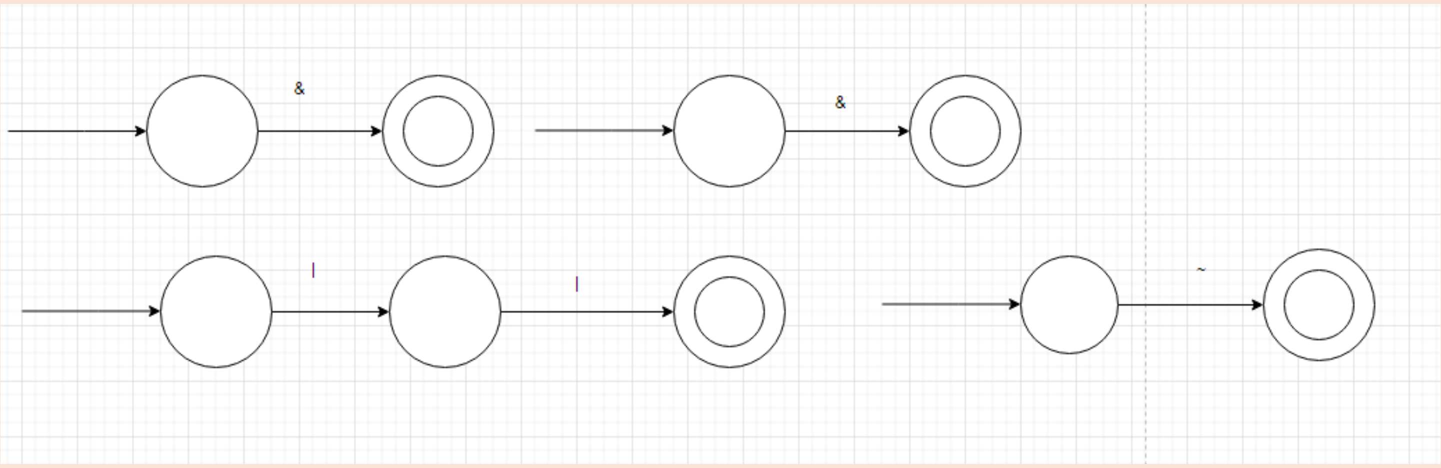
	+	-	*	/
1	**2**	**4**	**6**	**8**
2				
4				
6				
8				

D F A:

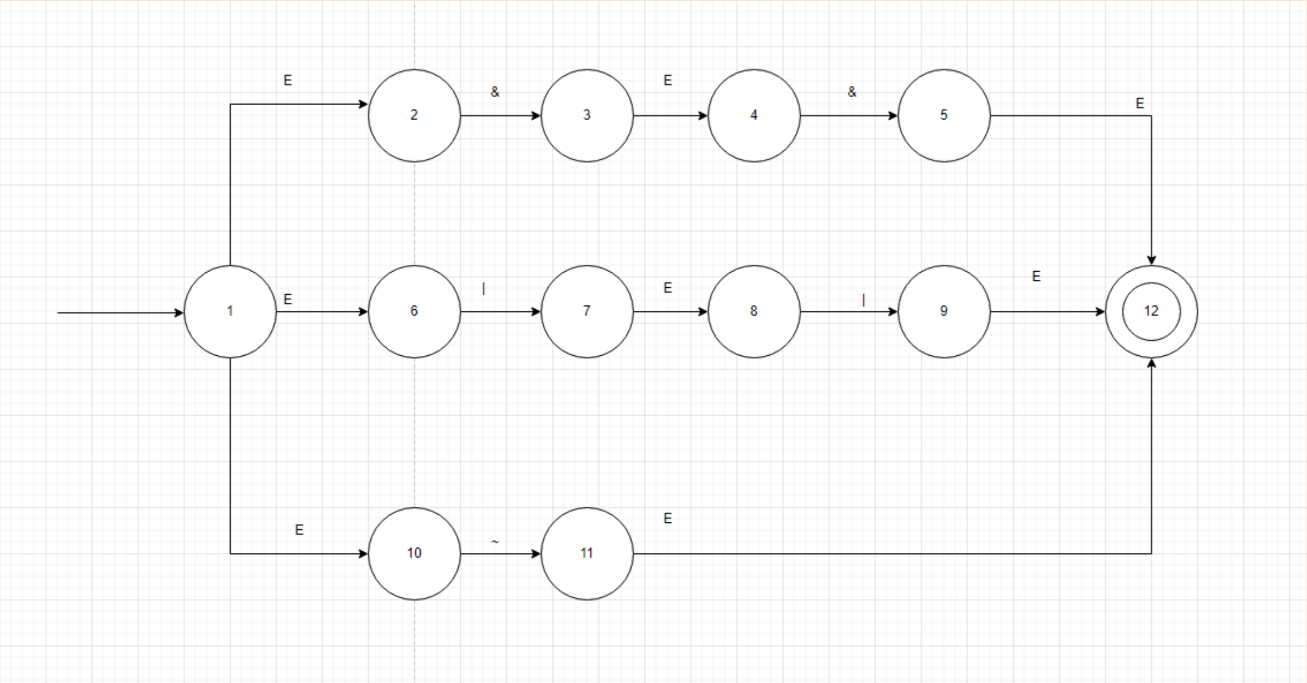


19-Logic operators:

RE = && | || | ~



N F A:



TRANSACTION TABLE :

1? = {1,2,6,10}

2? = {2,3}

3? = {3}

4? = {4,5}

6? = {6,7}

7? = {7}

8? = {8,9}

9? = {9}

5? = {5}

6? = {6,7}

7? = {7}

8? = {8,9}

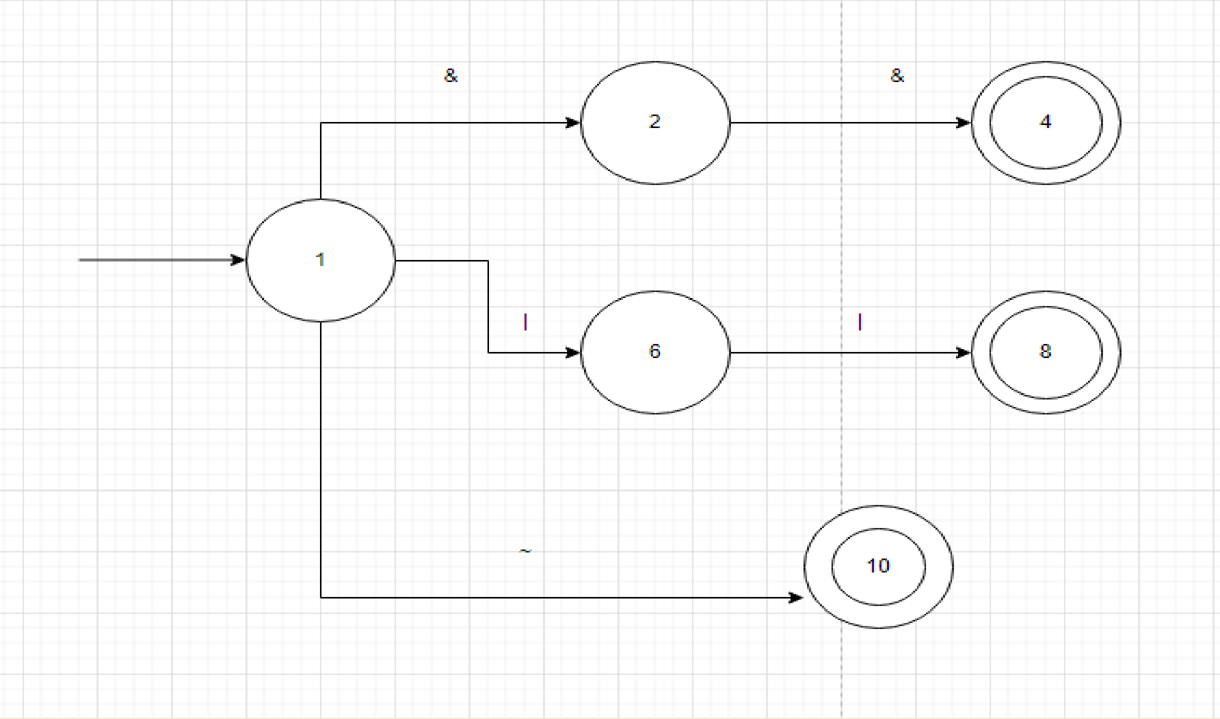
9? = {9}

10? = {10,11}

11? = {11}

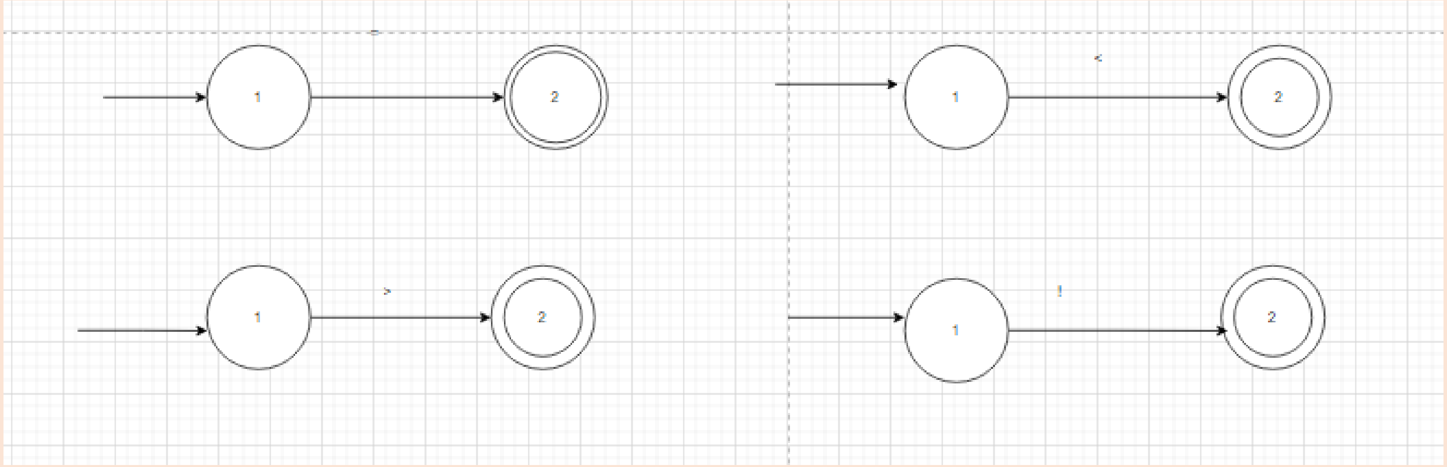
	&	&	|	|	~	
1	2		6		10	
2		4				
6				8		

DFA:



20-relational operators:

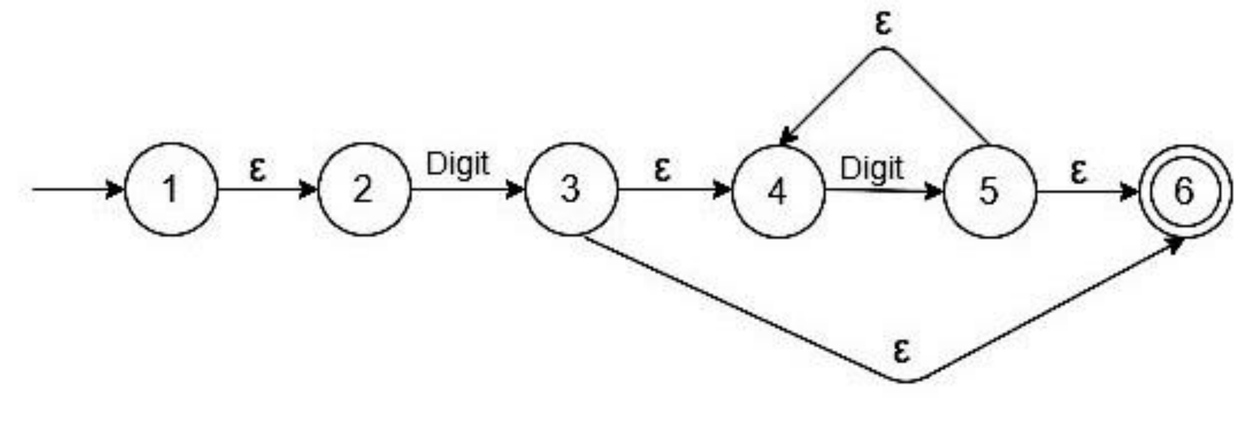
RE (==||!=|<=|>=)

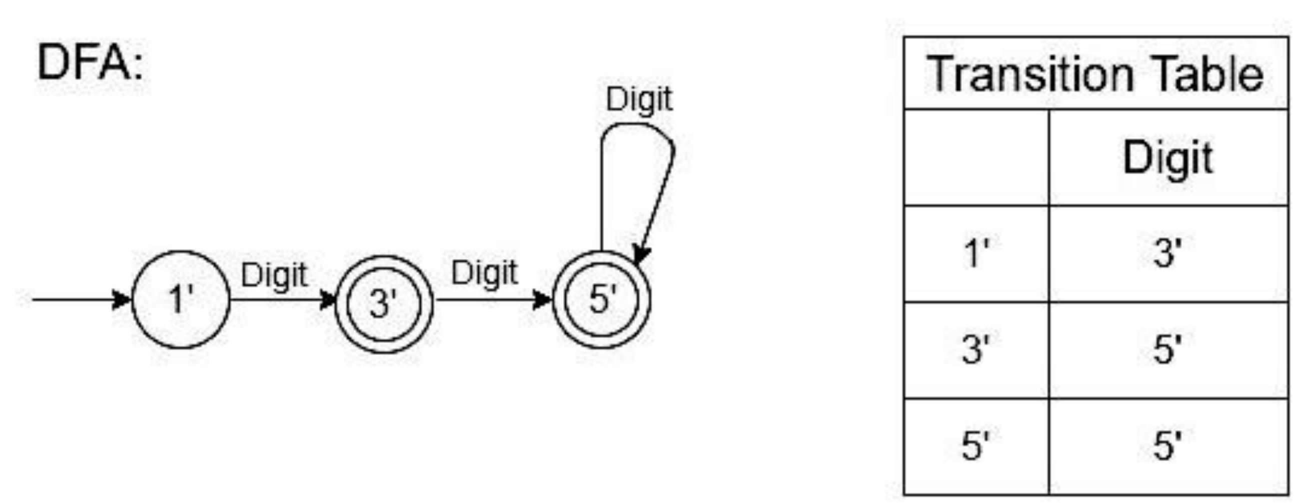


21-Numbers :

RE = Digit (Digit)* RE = [0-9]+

NFA:



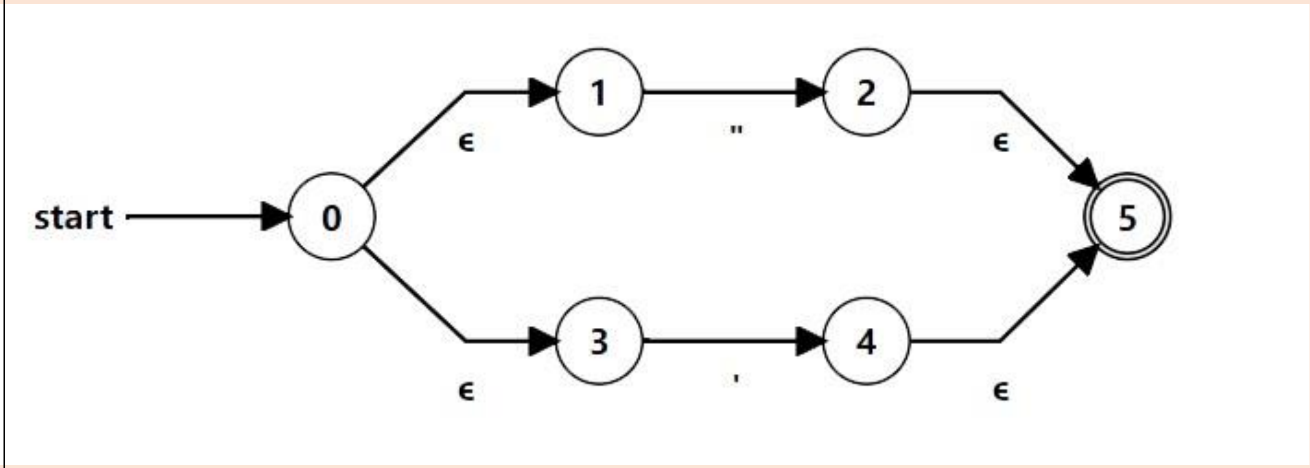


Transition Table	
	Digit
1'	3'
3'	5'
5'	5'

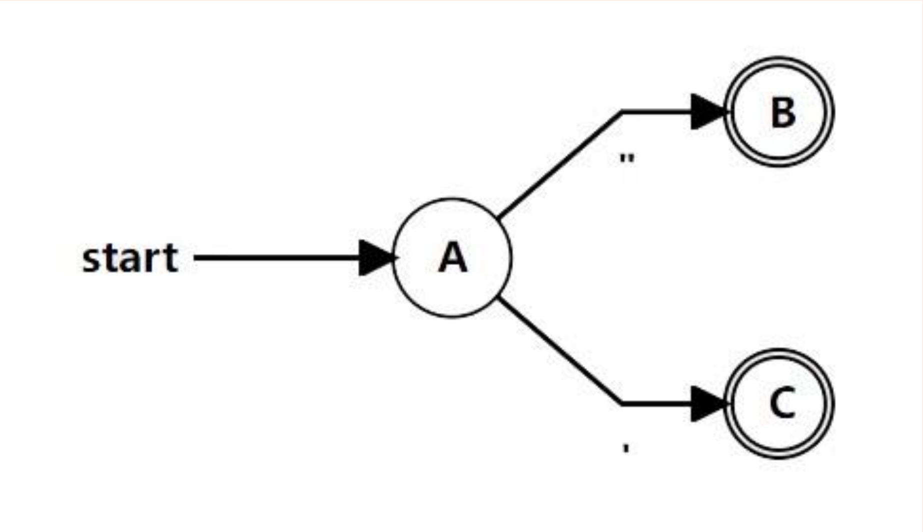
22-Quotation Marks

RE = ("|')

NFA:

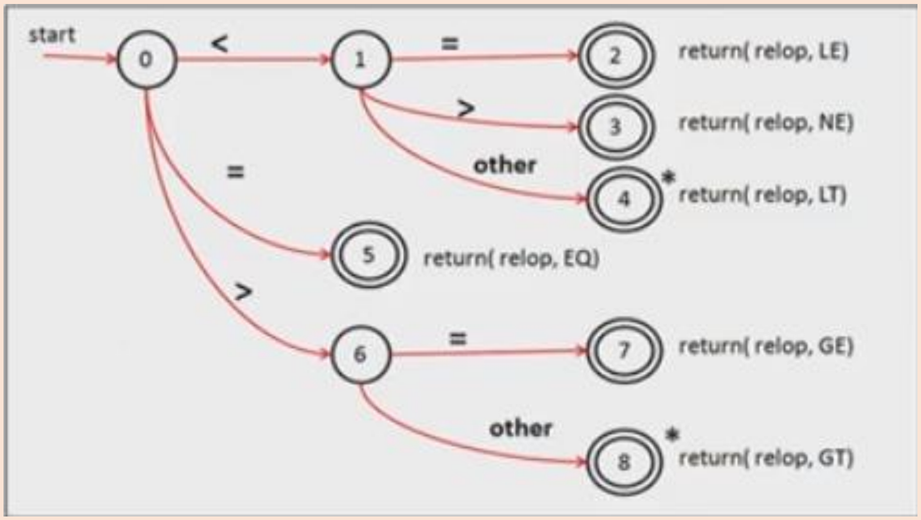


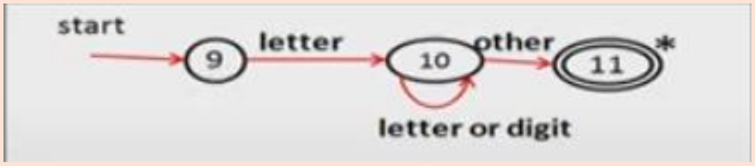
DFA:

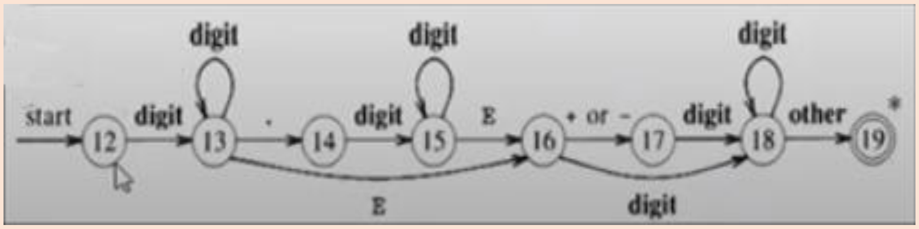


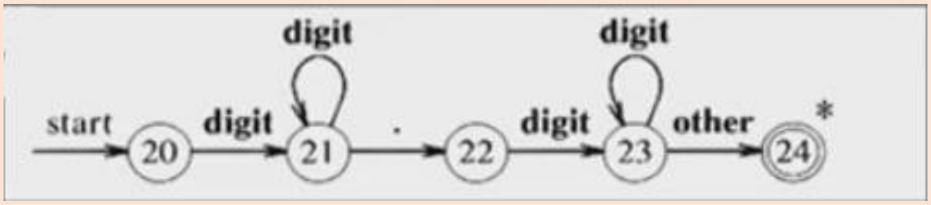
-Scanner:

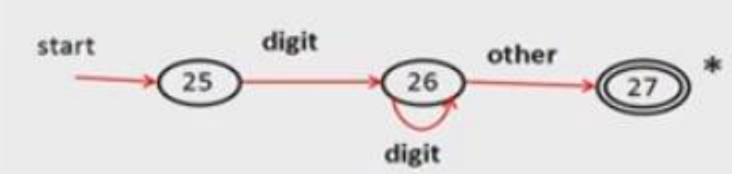
THE TRANSITION TABLE TO IMPLEMENT THE SCANNER:

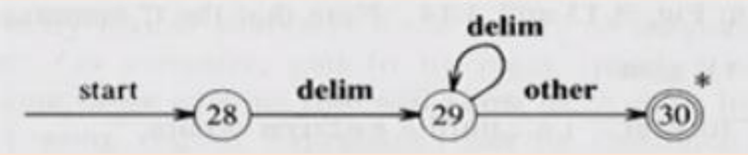












Parse tree and Abstract syntax tree

1. Program → Program ClassDeclaration End.

Program -> Program`
Program` -> ClassDeclaration End. Program` | ε

First(Program) = First(Program`) = { Category | ε }
First(Program`) = {First(ClassDeclaration) , ε } = { Category | ε }

Follow(Program) = { $ }
Follow(Program`) = Follow(Program) = { $ }

****

2. ClassDeclaration→ Category ID{ Class_Implementation} | Category ID Derive { Class_Implementation}

ClassDeclaration -> Category ID ClassDeclaration`
ClassDeclaration` -> { Class_Implementation} | Derive { Class_Implementation}

First(ClassDeclaration) = { Category}
First(ClassDeclaration`) = { { , Derive }

Follow(ClassDeclaration) = First(End) = { End }
Follow(ClassDeclaration`) = Follow(ClassDeclaration) = { End }
****

3. Class_Implementation→ VarDeclaration Class_Implementation| MethodDeclaration Class_Implementation | Comment Class_Implementation | using_command Class_Implementation| Func _Call Class_Implementation |empty

First(Class_Implementation) =
{ Ilap , Silap , Clop , Series , Ilapf , Silapf , None , Logical , < , - , using , ID , ε }

Follow(Class_Implementation) = { } }
****

4. MethodDeclaration→ Func Decl ; | Func Decl { VarDeclaration Statements }

First(MethodDeclaration) = First(Func Decl) = { Ilap , Silap , Clop , Series , Ilapf , Silapf , None , Logical }

Follow(MethodDeclaration) = {First(Class_Implementation) - ε } U Follow(Class_Implementation) = { Ilap , Silap , Clop , Series , Ilapf , Silapf , None , Logical , < , - , using , ID , } }

5. Func Decl →Type ID (ParameterList)

First(Func Decl) = First(Type) = { Ilap , Silap , Clop , Series , Ilapf , Silapf , None , Logical }

Follow(Func Decl) = { ; , { }
****

6. Type → Ilap | Silap | Clop | Series | Ilapf | Silapf | None | Logical

First(Type) = { Ilap , Silap , Clop , Series , Ilapf , Silapf , None , Logical }

Follow(Type) = { ID }
****

7. ParameterList →empty | None | Non-Empty List

First(ParameterList) = { ε, None , Ilap , Silap , Clop , Series , Ilapf , Silapf , None , Logical }

Follow(ParameterList) = {) }
****

8. Non-Empty List→ Type ID | Non-Empty List , Type ID

First(Non-Empty List) = { Ilap , Silap , Clop , Series , Ilapf , Silapf , None , Logical }

Follow(Non-Empty List) = Follow(ParameterList) = {) }
****

9. VarDeclaration→ empty | Type ID_List ; VarDeclaration

First(VarDeclaration) = { ε, Ilap , Silap , Clop , Series , Ilapf , Silapf , None , Logical }

Follow(VarDeclaration) = {First(Class_Implementation) - ε } U Follow(Class_Implementation) U {First(Statements) - ε} U Follow(MethodDeclaration) U = =
{ Ilap , Silap , Clop , Series , Ilapf , Silapf , None , Logical , < , - , using , ID , } , Assignment , If, Rotatewhen , Continuewhen , terminatethis , read , write , Replywith , =}

****

10. ID_List →ID | ID_List , ID

First(ID_List) = { ID }
Follow(ID_List) = { ; }
****

11. Statements→empty | Statement Statements

First(Statements) = { ε , Assignment , If, Rotatewhen , Continuewhen , terminatethis , read , write , Replywith }

Follow(Statements) = { } }
****

12. Statement→Assignment | If _Statement | Rotatewhen _Statement | Continuewhen_Statement | terminatethis _Statement|read (ID); | write (Expression); | Replywith _ Statement

First(Statement) = { Assignment , If, Rotatewhen , Continuewhen , terminatethis , read , write , Replywith }

Follow(Statement) = { First(Statements) - ε } ∪ Follow(Statements)
= {Assignment , If, Rotatewhen , Continuewhen , terminatethis , read , write , Replywith , } }
****

13. Assignment→ VarDeclaration = Expression;

First(Assignment) ={ First(VarDeclaration) - ε } ∪ = ∪ First(Expression) =
{ Ilap , Silap , Clop , Series , Ilapf , Silapf , None , Logical , = , ID , Number }

Follow(Assignment) = Follow(Statement) =
{Assignment , If, Rotatewhen , Continuewhen , terminatethis , read , write , Replywith , } }
****

14. Func _Call → ID (Argument_List) ;

First(Func _Call) = { ID }
Follow(Func _Call) = {First(Class_Implementation) - ε } U Follow(Class_Implementation) =
{ Ilap , Silap , Clop , Series , Ilapf , Silapf , None , Logical , < , - , using , ID , } }

****

15. Argument_List →empty | NonEmpty_Argument_List

First(Argument_List) = { ε , ID , Number }

Follow(Argument_List) = {) }
****

16. NonEmpty_Argument_List →Expression | NonEmpty_Argument_List , Expression

First(NonEmpty_Argument_List) = First(Expression) = { ID , Number}

Follow(NonEmpty_Argument_List) = Follow(Argument_List) = {) }
****

17. Block Statements→{statements }

First(Block Statements) = { { }

Follow(Block Statements) = Follow(If _Statement) ∪ Follow(Rotate _Statement) ∪ Follow(Continuewhen _Statement) =
= {Assignment , If, Rotatewhen , Continuewhen , terminatethis , read , write , Replywith , } }

****

18. If _Statement→ if (Condition _Expression) Block Statements

First(If _Statement) = { if }

Follow(If _Statement) = Follow(Statement) =
{Assignment , If, Rotatewhen , Continuewhen , terminatethis , read , write , Replywith , } }

****

19. Condition _Expression→ Condition |Condition Condition _Op Condition

First(Condition _Expression) = First(Condition) = First(Expression) = { ID , Number}

Follow(Condition _Expression) = {) }

20. Condition _Op → and | or

First(Condition _Op) = { and , or }

Follow(Condition _Op) = First(Condition) = { ID , Number}
****

21. Condition→ Expression Comparison _Op Expression

First(Condition) = First(Expression) = { ID , Number}

Follow(Condition) = Follow(Condition _Expression) U Follow(Condition _Op) = {) , ID , Number }

****

22. Comparison _Op → == | != | > | >= | < | <=

First(Comparison _Op) = { = , ! , > , < }

Follow(Comparison _Op) = First(Expression) = { ID , Number}
****

23. Rotate _Statement → Rotate when(Condition _Expression) Block Statements

First(Rotate _Statement) = { Rotate }

Follow(Rotate _Statement) = NA
****

24. Continuewhen _Statement →Continuewhen (expression ; expression ; expression) Block Statements

First(Continuewhen _Statement) = { Continuewhen)

Follow(Continuewhen _Statement) = Follow(Statement) =

{Assignment , If, Rotatewhen , Continuewhen , terminatethis , read , write , Replywith , } }
****

25. Replywith _Statement→ Replywith Expression ; | returnID ;

First(Replywith _Statement) = { Replywith , returnID }

Follow(Replywith _Statement) = Follow(Statement) =
{Assignment , If, Rotatewhen , Continuewhen , terminatethis , read , write , Replywith , } }

****

26. terminatethis _Statement→ terminatethis;

First(terminatethis _Statement) = { terminatethis }

Follow(terminatethis _Statement) = Follow(Statement) =
{Assignment , If, Rotatewhen , Continuewhen , terminatethis , read , write , Replywith , } }

****

27. Expression → Term |Expression Add_Op Term

First(Expression) = { ID , Number}

Follow(Expression) = { ; ,) , = , ! , > , < }
****

28. Add_Op → + | -

First(Add_Op) = { + , - }

Follow(Add_Op) = First(Term) = { ID , Number }
****

29. Term→ Factor| Term Mul_Op Factor

First(Term) = { ID , Number }

Follow(Term) = Follow(Expression) = { ; ,) , = , ! , > , < }

30. Mul_Op→* | /

First(Mul_Op) = { * , / }

Follow(Mul_Op) = First(Factor) = { ID , Number}

****

31. Factor→ ID| Number

First(Factor) = { ID , Number}

Follow(Factor) = Follow(Term) = Follow(Expression) = { ; ,) }
****

32. Comment →<* STR *> | -- STR

First(Comment) = { < , - }

Follow(Comment) = {First(Class_Implementation) - ε } U Follow(Class_Implementation) =
{ Ilap , Silap , Clop , Series , Ilapf , Silapf , None , Logical , < , - , using , ID , } }
****

33. using_command →using(F_name.txt);

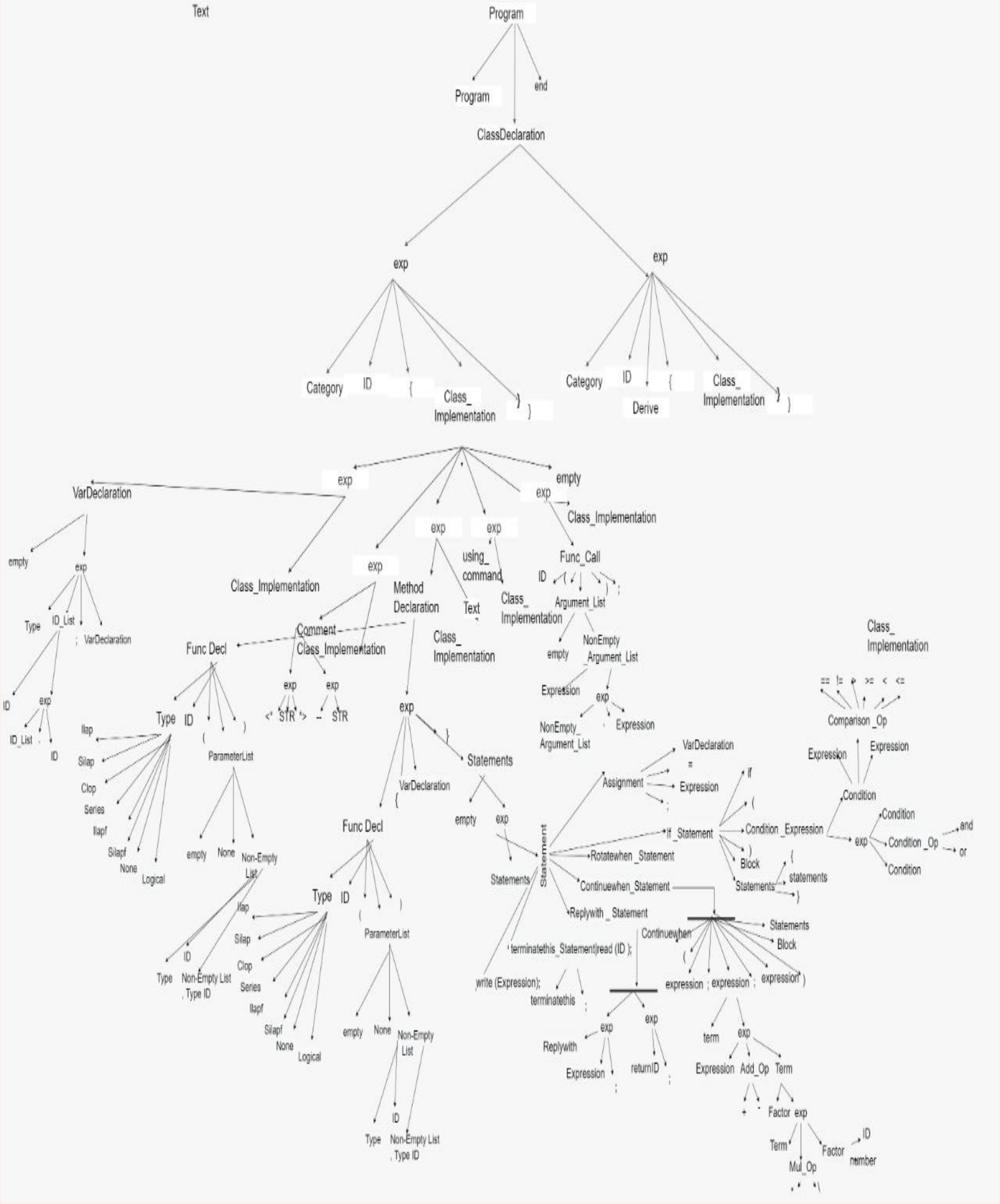
First(using_command) = { using }

Follow(using_command) = {First(Class_Implementation) - ε } U Follow(Class_Implementation) =
{ Ilap , Silap , Clop , Series , Ilapf , Silapf , None , Logical , < , - , using , ID , } }

****

34. F_name →STR

First(F_name) = { STR }
Follow(F_name) = { .txt }


Text
Program
Program
end
ClassDeclaration
exp
exp
Category
ID
{
Class_
Implementation
}
}
Category
ID
{
Derive
Class_
Implementation
}
}
exp
empty
VarDeclaration
exp
Class_Implementation
empty
exp
exp
exp
using_
command
Func_Call
Class_Implementation
exp
Method
Declaration
Text
Class_
Implementation
ID
(
)
;
Argument_List
Type
ID_List
;
VarDeclaration
Comment
Class_Implementation
Class_
Implementation
empty
NonEmpty
_Argument_List
Class_
Implementation
Func Decl
ID
exp
exp
exp
Expression
exp
== != > >= < <=
ID_List
,
ID
Type
ID
(
)
<*
STR
*>
--
STR
NonEmpty_
Argument_List
,
Expression
Comparison _Op
llap
Silap
Clop
Series
llapf
Silapf
None
Logical
ParameterList
VarDeclaration
{
}
Statements
VarDeclaration
=
Expression
;
Expression
Expression
Assignment
if
empty
None
Non-Empty
List
Func Decl
empty
exp
(
Condition
Statements
Statement
If_Statement
Condition _Expression
exp
Condition
Condition _Op
Condition
and
or
Rotatewhen _Statement
)
Block
{
statements
}
Statements
Continuewhen_Statement
Type
ID
(
)
ParameterList
Replywith _Statement
Continuewhen
Statements
Block
ID
Type
Non-Empty List
, Type ID
llap
Silap
Clop
Series
llapf
Silapf
None
Logical
terminatethis_Statement|read (ID);
write (Expression);
terminatethis
;
(
expression
;
expression
;
expression
)
empty
None
Non-Empty
List
exp
exp
Replywith
Expression
;
returnID
;
term
exp
Expression
Add_Op
Term
+
-
Factor
exp
ID
Type
Non-Empty List
, Type ID
Term
Mul_Op
Factor
ID
number
*
/
\