Faculty of Computer & Information Sciences

Ain Shams University

Subject: Compiler Theory

Year: 3rd level undergraduate

Academic year: 1st term 2021-2022

**Milestone (2)-Task (1)-CFG Rules**

Extra regular expressions:

Digit:=[0-9]

Letter:=[A-Za-z]

Statements:= (Condition\_Statement|Comment\_Statement|Function\_Call|Read\_Statement| Return\_Statement|

If\_Statement|Else\_Statement|Else\_If\_Statement|

Repeat\_Statement| Write\_Statement|

Assignment\_Statement|Declaration\_Statement)

Statements → Condition\_Statement | Comment\_Statement

| Function\_Call | Read\_Statement | If\_Statement

| Else\_Statement | Else\_If\_Statement

| Repeat\_Statement | Write\_Statement

| Assignment\_Statement |Declaration\_Statement

| Return\_Statement

States → Statements States\_repeatition

States\_repeatition → Statements States\_repeatition | ԑ

*term := term MultOp Factor | Factor*

term → Factor Ter

Ter → MultOp Factor Ter | ε

Factor → (Equation) | Term

AddOp := + | -

AddOp → + | -

MultOp := \* | /

MultOp → \* | /

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

1)Number:=^Digit+(\.Digit+)?

2)String:=^”(.\*)”$

3)Reserved\_Keywords:= (int | float | string | read | write | repeat | until | if | elseif | else | then | return | endl | end)

4)Comment\_Statement:=^( \/ \\*) (.\*)(\\*\/)$

5)Identifier:=Letter(Letter|Digit)\*

6) Arithmetic\_Operator:= (+ | - | \* | / )

7)Boolean\_Operator := ( && | \|\| )

8)Condition\_Operator := (< | > | = | <>)

9)Function\_Call:=Function\_Name\((Expression(,Expression)\*)?\)$

Function\_Call → Function\_Name (ArgList)

ArgList → Expression Arguments | ԑ

Arguments →, ArgList | ԑ

10)Term:=(Number|Identifier|Function\_Call)

Term → Number|Identifier|Function\_Call

Left Factoring: Term → Number|Identifier D

D-> ԑ | (ArgList)

11) *Equation := Equation AddOp term| term*

Equation → term Equ

Equ → AddOp term Equ | ε

12) Expression := (String|Term|Equation)

Expression → String|Term|Equation

13) Assignment\_Statement := Identifier \:\= Expression

Assignment\_Statement → Identifier := Expression

12) Datatype := (int|float|string)

Datatype → int|float|string

13) Declaration\_Statement :=

^Datatype (identifier | Assignment\_Statement)

(, identifier |, Assignment Statement)\*;$

Declaration\_Statement →

Datatype (identifier | Assignment\_Statement) Declare\_A ;

Declare\_A → ,(identifier | Assignment\_Statement) Declare\_A| ԑ

14)Write\_Statement:=^write (Expression | endl) ;$

Write\_Statement → write (Expression | endl);

15)Read\_Statement:=^read (Identifier) ;$

Read\_Statement → read Identifier ;

16)Return\_Statement := ^return (Expression);$

Return\_Statement → return Expression;

17)Condition := ^(Identifier) (Condition\_Operator) (Term)

Condition → Identifier Condition\_Operator Ter

18)Condition\_Statement := ^(Condition) [(Boolean\_Operator)(Condition)]\*

Condition\_Statement → Condition Condition\_State

Condition\_State → Boolean\_Operator Condition Condition\_State | ԑ

19) FunctionName:= Identifier

FunctionName → Identifier

20)If\_Statement := ^if (Condition\_Statement) then

[Statements]+ (Else\_If\_Statement | Else\_Statement| end)

If\_Statement → if (Condition\_Statement) Then States (Else\_If\_Statement | Else\_Statement| end)

21)Else\_If\_Statement := ^elseif (Condition\_Statement) then [Statements]+ (Else\_If\_Statement | Else\_Statement | end)

Else\_If\_Statement → elseif (Condition\_Statement) Then States (Else\_If\_Statement | Else\_Statement| end)

22)Else\_Statement := ^else [Statements]+ end$

Else\_Statement → else States end

23)Repeat\_Statements := ^repeat [Statements]+ until (Condition\_Statement)

Repeat\_Statements → repeat States until Condition\_Statement

24) Parameter:= (Datatype)(Identifier)

Parameter → Datatype Identifier

25) Function\_Declaration:= (Datatype)(Identifier)

\( ( Parameter(\,Parameter)\*)? \)

Function\_Declaration→ Datatype Identifier (Parameters\_list)

Parameter\_list → Parameter Parameter\_repeatition | ԑ

Parameter\_repeatition ->, Parameter Parameter\_repeatition | ԑ

28) Function\_Body:= \{ [Statements]+ (Return\_Statement)\}

Function\_Body -> { States Return\_Statement }

29)Function\_Statement:=(Function\_Declaration) (Function\_Body)

Function\_Statement -> Function\_Declaration Function\_Body

30)Main\_Function := (Datatype) main \( \) (Function\_Body)

Main\_Function -> Datatype main ( ) Function\_Body

31)Program:= (Function\_Statement)\* (Main\_Function)

Program -> User\_Function Main\_Function

User\_Function -> Function\_Statement User\_Function | ԑ