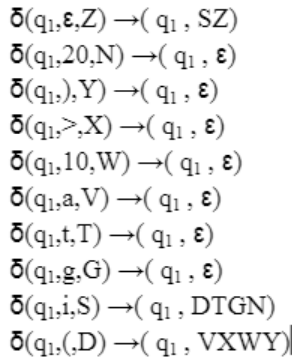
**Worksheet**

**Unit 3**

1. Consider following push down automata (Hint: i = if, t = then, g = goto)



(a) Convert the given PDA to CFG

(b) Simplify the grammar

(c) Convert to GNF form

(d) write the formal definition for both given PDA and Converted grammar

(e) Identify the string w=if (a<10) then goto 20 and write the ID for string

acceptance

1. A company named “FLA Designs and Solutions” launched a portal for the benefits of their employees. In this context, the employees need to be registered newly in the portal. For password generation the guidelines given as follows.
2. The password is combination of alphabets, digits and special characters.
3. The password should start with an alphabet and end with digit

Generate push down automata for this. Also validate the automata for an example string.

1. Consider the following set of grammars. These grammars generate infinite language of strings. Find the following:

The Symbol S is the starting symbol

S→wvS| wv

S→wV |wv ; V→vS

S→SS | wv

S→wV |w ; V→vS

S→wV ; V→vS|w

S→wV | v ; V→vS

S→wV ; V→vS |v

S→wV ; V→vS | wv

a) Identify the language generated by these grammars and find the pattern of language used in majority of grammars

b) The pairs of grammar that generate same language

c) Convert the one of the grammar found in previous question to CNF

d) Convert the Grammar to GNF

1. A PDA is defined as M={ Q,Σ,Γ,δ,q\_(0,) Z\_(0,) F} and its definition is as following:

Q={ a ,b} ,

Σ={x,y},

Γ={ Z\_0,S},

δ is given as follows∶

1.δ (a,ϵ,ϵ)=(a,Z\_0 )

2.δ(a,x,Z\_0 )=(a,SZ\_0 )

3.δ (a,x,S)=(a,SS)

4.δ(a,y,S)=(a,S)

5.δ(a,ϵ ,S)=(b,ϵ)

6.δ(b,ϵ,S)=(b,ϵ)

7.δ(b,y,S)=(p,SS)

8.δ(b,y,Z\_0 )=(b,ϵ)

a) Describe the working of the PDA

b) Show the ID moves for the input xyyxxyyxy

c) Find out the any of the possible input at when the PDA enter state b for the first time with all inputs consumed and the stack has the contents as SSZ\_0 i.e., what is (b,ϵ,SSZ\_0 )⊢ ?

d) Convert the above PDA to CFG

5. Consider the following Context Free Grammar,

Expt->Expr+Term/Term

Term-> Term\*Factor/Factor

Factor-> (Expr)/ a

Construct the parse tree for the input w=”(a+a)\*a”, where the parse tree is always binary.

1. A company organized an annual celebration event for all its employees. The employees participated in various games of the events. One such game is picking the ball from the pool. The employee has to pick the balls in the order specified. The one who is picking all the balls in the specified order at the earliest is the winner. The colored balls are Red, Green, Violet, Yellow.

Case (i): First, they should pick ‘n’ number of red balls then ‘m’ number of green balls then ‘n’ number of Violet balls and at last ‘p’ number of yellow balls.

Case (ii): Or else, first they should pick ‘n’ number of red balls then ‘m’ number of green balls then ‘2n’ number of Violet balls and at last ‘p’ number of yellow balls. The order should not vary. Design a single Push Down Automata to check the order and constraints of the game satisfying both the cases. Explain the designed PDA with example strings.

Evaluation Scheme for student reference

1. Identification of Non-deterministic Pushdown Automata

2. Writing Language and giving example strings for the given scenario

3. Construction of Non-deterministic PDA for the given statement

4. Formal Definition of Constructed PDA

5. Example for First case

6. Example for Second case

1. Read the Following Scenario and answer the following questions Consider there are two color cubes (Blue and Green) and a student must choose more blue cubes than that of the red cubes.

a. Generate the accepting language for above Scenario

b. List the PDA and CFG Tuple representation for above scenario

c. Frame the 3 rules for give scenario for PDA to CFG conversion

d. Design PDA transitions for the given scenario

e. Illustrate using a PDA Diagram for the above scenario

f. Using elimination rules for each transitions generate Context Free Grammar from given PDA

g. List the final productions

1. Consider the HTML table tags we have <tr> for table row and <td> for cell definition. For each row <tr>we have cell tag definition <td> cell content here</td>. Construct a push down automata to check the balancing of <td> and </td> tags and <tr> </tr> tags. Order need to be considered has to follow i.e.,

<tr>

<td>cell definition</td>

<td>cell definition</td>

</tr>

The automata for just check the balance in count of table row tags and cell definition

tags. Assume, for the strings in the language, that all the cell contents are removed

and only tags are present.

i) Write the language with simple string accepted by the automata.

ii) Construct a Grammar for the above scenario

iii) Convert the grammar to GNF

iv) Construct the PDA diagram, along with transition function

1. The esteem institute conducts the placement for all the final year students. The

students participated in various rounds of the placements. One such round is

choosing the pattern of the written exam. The student has to choose the questions in

the order specified. The one who is choosing all the questions in the specified order

of answering at the earliest is the winner. The questions are MCQ, FILL IN THE

BLANKS, MATCH THE FOLLOWING, DESCRIPTIVE.

Case (i)

First, they should choose and answer ‘n’ number of MCQ then ‘m’ number of FILL

IN THE BLANKS then ‘n’ number of MATCH THE FOLLOWING and at last ‘p’

number of DESCRIPTIVE

Case (ii)

Or else First, they should choose and answer ‘n’ number of MCQ then ‘m’ number

of FILL IN THE BLANKS then ‘2n’ number of MATCH THE FOLLOWING and

at last ‘p’ number of DESCRIPTIVE.

The order should not be changed. Design the suitable pushdown automata to check

the order and satisfies the above cases. Illustrate with an example pattern.

Evaluation Scheme for student reference

1. Identification of Non-deterministic Pushdown Automata

2. Writing Language and giving example strings for the given scenario

3. Construction of Non-deterministic PDA for the given statement

4. Formal Definition of Constructed PDA

4. Example for First case

5. Example for Second case

1. Let Σ = {a, b, c, +, ×,(,)}. Design a PDA whose language is {w | w is a valid

algebraic expression}.The Open bracket should be always end with close bracket. L

is the language in which given alphabets abc. Apply the logic, represent the

necessary transition function and diagram with tuple representation.