PDA-Acceptance by Final State

1. A push down automaton employs _____ data structure.
a) Queue
b) Linked List
c) Hash Table
d) Stack

Answer: d
Explanation: A push down automata uses a stack to carry out its operations. They are more capable than the finite automatons but less than the turing model.

2. State true or false:
Statement: The operations of PDA never work on elements, other than the top.
a) true
b) false

Answer: a
Explanation: The term pushdown refers to the fact that the elements are pushed down in the stack and as per the LIFO principle, the operation is always performed on the top element of the stack.

3. Which of the following allows stacked values to be sub-stacks rather than just finite symbols?
a) Push Down Automaton
b) Turing Machine
c) Nested Stack Automaton
d) None of the mentioned

Answer: c
Explanation: In computational theory, a nested stack automaton is a finite automaton which makes use of stack containing data which can be additional stacks

4. A non deterministic two way, nested stack automaton has n-tuple definition. State the value of n.
a) 5
b) 8
c) 4
d) 10

Answer: d
Explanation: The 10-tuple can be stated as: NSA= ‹Q,Σ,Γ,δ,q0,Z0,F,[,],]›.

5. Push down automata accepts _____ languages.
a) Type 3
b) Type 2
c) Type 1
d) Type 0

Answer: b
Explanation: Push down automata is for Context free languages and they are termed as Type 2 languages according to Chomsky hierarchy.

6. The class of languages not accepted by non deterministic, nonerasing stack automata is _____
a) NSPACE(n2)
b) NL
c) CSL
d) All of the mentioned

Answer: d
Explanation: NSPACE or non deterministic space is the computational resource describing the memory space for a non deterministic turing machine.

7. A push down automaton with only symbol allowed on the stack along with fixed symbol.
a) Embedded PDA
b) Nested Stack automata
c) DPDA
d) Counter Automaton

Answer: d
Explanation: This class of automata can recognize a set of context free languages like {anbn|n belongs to N}

8. Which of the operations are eligible in PDA?
a) Push
b) Delete
c) Insert
d) Pop

Answer: a, d
Explanation: Push and pop are the operations we perform to operate a stack. A stack follows the LIFO principle, which states its rule as: Last In First Out.

9. A string is accepted by a PDA when
a) Stack is empty
b) Acceptance state
c) Both (a) and (b)
d) None of the mentioned

Answer: c
Explanation: When we reach the acceptance state and find the stack to be empty, we say, the string has been accepted by the push down automata.

10. The following move of a PDA is on the basis of:
a) Present state
b) Input Symbol
c) Both (a) and (b)
d) None of the mentioned

Answer: c
Explanation: The next operation is performed by PDA considering three factors: present state, symbol on the top of the stack and the input symbol.

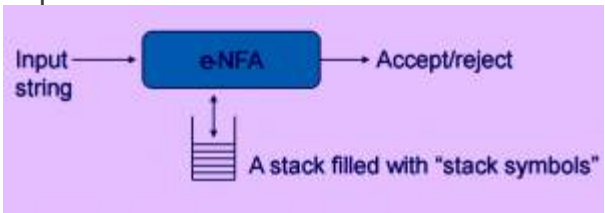
From Grammars to Push Down Automata

1. The production of the form A->B , where A and B are non terminals is called
a) Null production
b) Unit production
c) Greibach Normal Form
d) Chomsky Normal Form

Answer: b
Explanation: A->ε is termed as Null production while A->B is termed as Unit production.

3. A push down automata can be represented as:
PDA= ε-NFA +[stack] State true or false:
a) true
b) false

Answer: a
Explanation:



4. A pushdown automata can be defined as: (Q, ∑, G, q0, z0, A, d)
What does the symbol z0 represents?
a) an element of G
b) initial stack symbol
c) top stack alphabet
d) all of the mentioned

Answer: d
Explanation: z0 is the initial stack symbol, is an element of G. Other symbols like d represents the transition function of the machine.

5. Which of the following correctly recognize the symbol '|-' in context to PDA?
a) Moves
b) transition function
c) or/not symbol
d) none of the mentioned

Answer: a
Explanation: Using this notation, we can define moves and further acceptance of a string by the machine.

6. Which among the following is true for the given statement?
Statement :If there are strings R and T in a language L so that R is prefix of T and R is not equivalent to T.
a) No DPDA can accept L by empty stack
b) DPDA can accept L by an empty stack
c) L is regular
d) None of the mentioned

Answer: a
Explanation: If M is a DPDA accepting L by an empty stack, R and T are distinct strings in L, and R is a prefix of T, then the sequence of moves M must make in order to accept R leaves the stack empty, since R∈L. But then T cannot be accepted, since M cant move with an empty stack.

7. Which of the following can be accepted by a DPDA?
a) The set of even length palindrome over {a,b}
b) The set of odd length palindrome over {a,b}
c) {xx^c| where c stands for the complement,{0,1}}
d) None of the mentioned

Answer: d
Explanation: Theorem: The language pal of palindromes over the alphabet {0,1} cannot be accepted by any finite automaton , and it is therefore not regular.

8. For a counter automaton, with the symbols A and Z0, the string on the stack is always in the form of _____
a) A
b) A^nZ0, n>=0
c) $Z0A^n$, n>=0
d) None of the mentioned

Answer: b
Explanation:The possible change in the stack contents is a change in the number of A's on the stack.

9. State true or false:
Statement: Counter Automaton can exist for the language $L=\{0^i1^i|i>=0\}$
a) true
b) false

Answer: a
Explanation: The PDA works as follows. Instead of saving excess 0's or 1's on the stack, we save *'s and use two different states to indicate which symbol there is currently a surplus of. The state q0 is the initial state and the only accepting state.

10. Let ∑={0,1}* and the grammar G be:
S->ε
S->SS
S->0S1|1S0
State which of the following is true for the given
a) Language of all and only Balanced strings
b) It contains equal number of 0's and 1's
c) Ambiguous Grammar
d) All of the mentioned

Answer: d
Explanation: A string is said to be balanced if it consist of equal number of 0's and 1's.

1. The transition a Push down automaton makes is additionally dependent upon the:
a) stack
b) input tape
c) terminals
d) none of the mentioned

Answer: a
Explanation: A PDA is a finite machine which has an additional stack storage. Its transitions are based not only on input and the correct state but also on the stack.

2. A PDA machine configuration (p, w, y) can be correctly represented as:
a) (current state, unprocessed input, stack content)
b) (unprocessed input, stack content, current state)

c) (current state, stack content, unprocessed input)
d) none of the mentioned

Answer: a
Explanation: A machine configuration is an element of K×Σ*×Γ*.
(p,w,γ) = (current state, unprocessed input, stack content).

4. With reference of a DPDA, which among the following do we perform from the start state with an empty stack?
a) process the whole string
b) end in final state
c) end with an empty stack
d) all of the mentioned

Answer: d
Explanation: The empty stack in the end is our requirement relative to finite state automatons.

5. A DPDA is a PDA in which:
a) No state p has two outgoing transitions
b) More than one state can have two or more outgoing transitions
c) Atleast one state has more than one transitions
d) None of the mentioned

Answer: a
Explanation: A Deterministic Push Down Automata is a Push Down Automata in which no state p has two or more transitions.

6. State true or false:
Statement: For every CFL, G, there exists a PDA M such that L(G) = L(M) and vice versa.
a) true
b) false

Answer: a
Explanation: There exists two lemma's such that:
a) Given a grammar G, construct the PDA and show the equivalence
b) Given a PDA, construct a grammar and show the equivalence

7. If the PDA does not stop on an accepting state and the stack is not empty, the string is:
a) rejected
b) goes into loop forever
c) both (a) and (b)
d) none of the mentioned

Answer: a
Explanation: To accept a string, PDA needs to halt at an accepting state and with a stack empty, else it is called rejected. Given a PDA M, we can construct a PDA M' that accepts the same language as M, by both acceptance criteria.

8. A language accepted by Deterministic Push down automata is closed under which of the following?
a) Complement
b) Union
c) Both (a) and (b)
d) None of the mentioned

Answer: a
Explanation: Deterministic Context free languages(one accepted by PDA by final state), are drastically different from the context free languages. For example they are closed under complementation and not union.

9. Which of the following is a simulator for non deterministic automata?
a) JFLAP
b) Gedit
c) FAUTO
d) None of the mentioned

Answer: a
Explanation: JFLAP is a software for experimenting with formal topics including NFA, NPDA, multi-tape turing machines and L-systems

10. Finite-state acceptors for the nested words can be:
a) nested word automata
b) push down automata
c) ndfa
d) none of the mentioned

Answer: a
Explanation: The linear encodings of languages accepted by finite nested word automata gives the class of 'visibly pushdown automata'.

1. Which of the following is analogous to the following?
:NFA and NPDA
a) Regular language and Context Free language
b) Regular language and Context Sensitive language
c) Context free language and Context Sensitive language
d) None of the mentioned

Answer: a
Explanation: All regular languages can be accepted by a non deterministic finite automata and all context free languages can be accepted by a non deterministic push down automata.

3. Which of the following relates to Chomsky hierarchy?
a) Regular<CFL<CSL<Unrestricted
b) CFL<CSL<Unrestricted<Regular
c) CSL<Unrestricted<CF<Regular
d) None of the mentioned

Answer: a
Explanation: The chomsky hierarchy lays down the following order:
Regular<CFL<CSL<Unrestricted

4. A language is accepted by a push down automata if it is:
a) regular
b) context free
c) both (a) and (b)
d) none of the mentioned

Answer: c
Explanation: All the regular languages are the subset to context free languages and thus can be accepted using push down automata.

DPDA and Context Free Languages

1. Context free grammar is called Type 2 grammar because of _____ hierarchy.
a) Greibach
b) Backus
c) Chomsky
d) None of the mentioned

Answer: c
Explanation: Chomsky hierarchy decide four type of language :Type 3- Regular Language, Type 2-Context free language, Type 1-Context Sensitive Language, Type 0- Unrestricted or Recursively Ennumerable language.

2. a→b
Restriction: Length of b must be atleast as much length of a.
Which of the following is correct for the given assertion?

a) Greibach Normal form
b) Context Sensitive Language
c) Chomsky Normal form
d) Recursively Ennumerable language

Answer: b
Explanation: A context-sensitive grammar (CSG) is a formal grammar in which the left-hand sides and right-hand sides of any production rules may be surrounded by a context of terminal and non terminal symbols. Context-sensitive grammars are more general than context-free grammars, in the sense that there are some languages that cannot be described by context-free grammars, but can be described by CSG.

3. From the definition of context free grammars,
G=(V, T, P, S)
What is the solution of V intersection T?
a) Null
b) Not Null
c) Cannot be determined, depends on the language
d) None of the mentioned

Answer: a
Explanation: V is the set of non terminal symbols while T is the st of terminal symbols, their intersection would always be null.

4. If P is the production, for the given statement, state true or false.
P: V->(V∑T)* represents that the left hand side production rule has no right or left context.
a) true
b) false

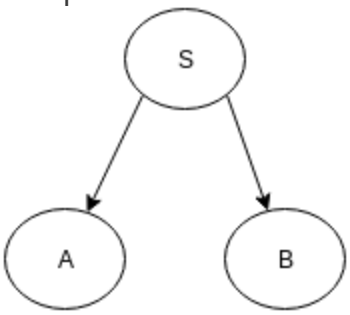
Answer: a
Explanation: Here the production P is from the definition of Context free grammar and thus, has no right or left context.

5. There exists a Context free grammar such that:
X->aX
Which among the following is correct with respect to the given assertion?
a) Left Recursive Grammar
b) Right Recursive Grammar
c) Non Recursive Grammar
d) None of the mentioned

Answer: b
Explanation: The grammar with right recursive production is known as Right recursive grammar. Right recursive production is of the form X->aX where a is a terminal and X is a non terminal.

6. If the partial derivation tree contains the root as the starting variable, the form is known as:
a) Chomsky hierarchy
b) Sentential form
c) Root form
d) None of the mentioned

Answer: b
Explanation: Example: For any grammar, productions be:
S->AB
A->aaA| ^
B->Bb| ^
The partial derivation tree can be drawn as:



Since it has the root as S, this can be said to be in sentential form.

7. Find a regular expression for a grammar which generates a language which states : L contains a set of strings starting wth an a and ending with a b, with something in the middle.
a) a(a*Ub*)b
b) a*(aUb)b*
c) a(a*b*)b
d) None of the mentioned

Answer: a
Explanation: The grammar for the same language can be stated as :
(1) S → aMb
(2) M → A
(3) M → B
(4) A → e
(5) A → aA
(6) B → e
(7) B → bB

8. Which of the following is the correct representation of grammar for the given regular expression?
a(aUb)*b

a) (1) S → aMb
(2) M → e
(3) M → aM
(4) M → bM

b) (1) S → aMb
(2) M → Mab
(3) M → aM
(4) M → bM

c) (1) S → aMb
(2) M → e
(3) M → aMb
(4) M → bMa

d) None of the mentioned

DPDA and Ambiguous Grammars

1. CFGs are more powerful than:
a) DFA
b) NDFA
c) Mealy Machine
d) All of the mentioned

Answer: d
Explanation:
Context-free grammars are strictly more powerful than regular expressions:
1) Any language that can be generated using regular expressions can be generated by a context-free grammar.
2) There are languages that can be generated by a context-free grammar that cannot be generated by any regular expression.
As a corollary, CFGs are strictly more powerful than DFAs and NDFAs.

2. State true or false:
S-> 0S1|01
Statement: No regular expression exists for the given grammar.
a) true
b) false

Answer: a
Explanation: The grammar generates a language L such that $L=\{0^n1^n|n>=1\}$ which is not regular. Thus, no regular expression exists for the same.

3. For the given set of code, the grammar representing real numbers in Pascal has error in one of the six lines. Fetch the error.
(1) ->
(2) -> | epsilon
(3) -> | epsilon
(4) -> 'E' | epsilon
(5) -> + | – | epsilon
(6) -> 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9
a) 3
b) 4
c) 2
d) No errors

Answer: a
Explanation:
–>
–> | epsilon
–> '.' | epsilon
–> 'E' | epsilon
–> + | – | epsilon
–> 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9

4. Which among the following is incorrect with reference to a derivation tree?
a) Every vertex has a label which is a terminal or a variable.
b) The root has a label which can be a terminal.
c) The label of the internal vertex is a variable.
d) None of the mentioned

Answer: b
Explanation: The root or interms of the grammar, starting variable can not be a terminal.

5. Let G=(V, T, P, S)
where a production can be written as:
S->aAS|a
A->SbA|ba|SS
Which of the following string is produced by the grammar?
a) aabbaab
b) aabbaa
c) baabab
d) None of the mentioned

Answer: b
Explanation: The step wise grammar translation can be written as:
aAS->aSbaA->aabAS->aabbaa

6. Statement 1: Ambiguity is the property of grammar but not the language.
Statement 2: Same language can have more than one grammar.
Which of the following options are correct with respect to the given statements?
a) Statement 1 is true but statement 2 is false
b) Statement 1 is false but statement 2 is true
c) Both the statements are true
d) Both the statements are false

Answer: c
Explanation: One language can more than one grammar. Some can be ambiguous and some cannot.

7. Which of the following are non essential while simplifying a grammar?
a) Removal of useless symbols
b) Removal of unit productions
c) Removal of null production
d) None of the mentioned

Answer: d
Explanation: Here are some process used to simplify a CFG but to produce an equivalent grammar:
a) Removal of useless symbols(non terminal) b) Removal of Unit productions and c) Removal of Null productions.

8. Which of the following are context free language?
a) $L=\{a^ib^j|i>=0\}$
b) $L=\{ww^r|$ w is a string and r represents reverse$\}$
c) Both (a) and (b)
d) one of the mentioned

Answer: a
Explanation: None. 9. The language $L =\{a^i2b^j|i>=0\}$ is:
a) recursive
b) deterministic CFL
c) regular
d) Two of the mentioned is correct

10. L->rLt|tLr|t|r
The given grammar produces a language which is:
a) All palindrome
b) All even palindromes
c) All odd palindromes
d) Strings with same begin and end symbolsAnswer: d
Explanation: The language is recursive and every recursive language is a CFL.

Answer: c
Explanation: As there exists no production for the palindrome set, even palindromes like abba, aabbaa, baaaaaab, etc will not be generated.