

NADAR SARASWATHI COLLEGE OF ENGINEERING AND TECHNOLOGY, THENI.

Course/Branch : BE / CSE	Year / Semester : III / V	Format No.	NAC/TLP-07a.13
Subject Code : CS8501	Subject Name : Theory of Computation	Rev. No.	02
Unit No : III	Unit Name : Context Free Grammar and Languages	Date	08.10.2020

OBJECTIVE TYPE QUESTION BANK

S. No.	Objective Questions (MCQ /True or False / Fill up with Choices)	BTL
1.	<p>$S \rightarrow aSa bSb a b$; The language generated by the above grammar over the alphabet $\{a,b\}$ is the set of</p> <p>A) All palindromes B) All odd length palindromes C) Strings that begin and end with the same symbol D) All even length palindromes</p>	L3
2.	<p>Let $L = L1 \cap L2$, where $L1$ and $L2$ are languages as defined below:</p> <p>$L1 = \{a^m b^m c a^n b^n \mid m, n \geq 0\}$ $L2 = \{a^i b^j c^k \mid i, j, k \geq 0\}$</p> <p>A) Not recursive B) Regular C) Context free but not regular D) Recursively enumerable but not context free</p>	L3
3.	<p>Consider the CFG with $\{S,A,B\}$ as the non-terminal alphabet, $\{a,b\}$ as the terminal alphabet, S as the start symbol and the following set of production rules</p> <p>$S \rightarrow aB \quad S \rightarrow bA$ $B \rightarrow b \quad A \rightarrow a$ $B \rightarrow bS \quad A \rightarrow aS$ $B \rightarrow aBB \quad A \rightarrow bAA$</p> <p>A) aaaabb B) aabbbb C) aabbab D) abbbba</p>	L3
4.	<p>Consider the following languages over the alphabet $\Sigma = \{0,1, c\}$:</p> <p>$L_1 = \{0^n 1^n \mid n \geq 0\}$ $L_2 = \{wcw^r \mid w \in \{0,1\}^*\}$ $L_3 = \{ww^r \mid w \in \{0,1\}^*\}$</p> <p>Here, w^r is the reverse of the string w. Which of these languages are deterministic Context-free languages?</p> <p>A) None of the languages B) Only $L1$ C) Only $L1$ and $L2$ D) All the three languages</p>	L2

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5.	<p>Consider the following statements about the context free grammar $G = \{S \rightarrow SS, S \rightarrow ab, S \rightarrow ba, S \rightarrow \epsilon\}$ I. G is ambiguous II. G produces all strings with equal number of a's and b's III. G can be accepted by a deterministic PDA. Which combination below expresses all the true statements about G? A) I only B) I and III only C) II and III only D) I, II and III</p>	L3
6.	<p>Which one of the following grammars generates the language $L = \{a^i b^j \mid i \neq j\}$</p> <p>(A) $S \rightarrow AC \mid CB$ $C \rightarrow aC b \mid a \mid b$ $A \rightarrow a A \mid \epsilon$ $B \rightarrow B b \mid \epsilon$</p> <p>(B) $S \rightarrow aS \mid Sb \mid a \mid b$</p> <p>(C) $S \rightarrow AC \mid CB$ $C \rightarrow aC b \mid \epsilon$ $A \rightarrow a A \mid \epsilon$ $B \rightarrow B b \mid \epsilon$</p> <p>(D) $S \rightarrow AC \mid CB$ $C \rightarrow aC b \mid \epsilon$ $A \rightarrow a A \mid a$ $B \rightarrow B b \mid b$</p> <p>A) A B) B C) C D) D</p>	L3
7.	<p>The language $\{a^m b^n C^{m+n} \mid m, n \geq 1\}$ is A) regular B) context-free but not regular C) context sensitive but not context free D) type-0 but not context sensitive</p>	L2
8.	<p>Let $G = (\{S\}, \{a, b\}, R, S)$ be a context free grammar where the rule set R is $S \rightarrow a S b \mid SS \mid \epsilon$ Which of the following statements is true? A) G is not ambiguous B) There exist $x, y, \in L(G)$ such that $xy \notin L(G)$ C) There is a deterministic pushdown automaton that accepts $L(G)$ D) We can find a deterministic finite state automaton that accepts $L(G)$</p>	L2

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9.	The language accepted by a Pushdown Automation in which the stack is limited to 10 items is best described as A) Context Free B) Regular C) Deterministic Context Free D) Recursive	L2
10.	Which of the following statements is true? A) If a language is context free it can always be accepted by a deterministic push-down automaton B) The union of two context free languages is context free C) The intersection of two context free languages is context free D) The complement of a context free language is context free	L2
11.	Which of the following languages are context-free? $L1 = \{a^m b^n a^n b^m \mid m, n \geq 1\}$ $L2 = \{a^m b^n a^m b^n \mid m, n \geq 1\}$ $L3 = \{a^m b^n \mid m = 2n + 1\}$ A) L1 and L2 only B) L1 and L3 only C) L2 and L3 only D) L3 only	L2
12.	Which one of the following statements is FALSE? A) There exist context-free languages such that all the context-free grammars generating them are ambiguous B) An unambiguous context free grammar always has a unique parse tree for each string of the language generated by it. C) Both deterministic and non-deterministic pushdown automata always accept the same set of languages D) A finite set of string from one alphabet is always a regular language.	L2
13.	Consider the following context-free grammars: $G_1: S \rightarrow aS \mid B, B \rightarrow b \mid bB$ $G_2: S \rightarrow aA \mid bB, A \rightarrow aA \mid B \mid \epsilon, B \rightarrow bB \mid \epsilon$ Which one of the following pairs of languages is generated by G1 and G2, respectively (A) $\{a^m b^n \mid m > 0 \text{ or } n > 0\}$ and $\{a^m b^n \mid m > 0 \text{ and } n > 0\}$ (B) $\{a^m b^n \mid m > 0 \text{ and } n > 0\}$ and $\{a^m b^n \mid m > 0 \text{ or } n \geq 0\}$ (C) $\{a^m b^n \mid m \geq 0 \text{ or } n > 0\}$ and $\{a^m b^n \mid m > 0 \text{ and } n > 0\}$ (D) $\{a^m b^n \mid m \geq 0 \text{ and } n > 0\}$ and $\{a^m b^n \mid m > 0 \text{ or } n > 0\}$ A) A B) B C) C D) D	L3

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14.	A CFG G is given with the following productions where S is the start symbol, A is a non-terminal and a and b are terminals. $S \rightarrow aS A$ $A \rightarrow aAb bAa \epsilon$ Which of the following strings is generated by the grammar above? A) aabbaba B) aabaaba C) abababb D) aabbaab	L3
15.	Context free languages are closed under A) Union, Intersection B) Union, Kleene closure C) Intersection, Complement D) Complement, Kleene closure	L2
16.	Which of the following languages over {a,b,c} is accepted by a deterministic pushdown automata? a. $\{wcw^R \mid w \in \{a,b\}^*\}$ b. $\{ww^R \mid w \in \{a,b,c\}^*\}$ c. $\{a^n b^n c^n \mid n \geq 0\}$ d. $\{w \mid w \text{ is a palindrome over } \{a,b,c\}\}$ <i>Note: w^R is the string obtained by reversing 'w'</i> A) a B) b C) c D) d	L2
17.	Consider the grammar with productions $S \rightarrow aSb \mid SS \mid \epsilon$ This grammar is A) not context-free, not linear B) not context-free, linear C) context-free, not linear D) context free, linear	L3
18.	Identify the language generated by the following grammar $S \rightarrow AB$ $A \rightarrow aAb \mid \epsilon$ $B \rightarrow bB \mid b$ A) $\{a^m b^n \mid n \geq m, m > 0\}$ B) $\{a^m b^n \mid n \geq m, m \geq 0\}$ C) $\{a^m b^n \mid n > m, m > 0\}$ D) $\{a^m b^n \mid n > m, m \geq 0\}$	L3

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19.	Context free grammar is not closed under: A) Concatenation B) Complementation C) Kleene Star D) Union	L2
20.	Which one of the following is FALSE? A) There is a unique minimal DFA for every regular language B) Every NFA can be converted to an equivalent PDA C) Compliment of every context-free language is recursive D) Every non-deterministic PDA can be converted to an equivalent deterministic PDA	L2
21.	What is the number of steps required to derive the string ((O O) O) S → SS S → (S) S → ε A) 10 B) 15 C) 12 D) 16	L3
22.	Consider the following grammar. S → AB A → a A → BaB B → bbA Which of the following statements is FALSE? A) The length of every string produced by this grammar is even B) No string produced by this grammar has three consecutive a's C) The length of substring produced by B is always odd D) No string produced by this grammar has four consecutive b's	L2
23.	If all the production rules have single non-terminal symbol on the left side, the grammar defined is: A) context free grammar B) context sensitive grammar C) unrestricted grammar D) phrase grammar	L2
24.	The context free grammar given by S → XYX X → aX bX ε Y → bbb generates the language which is defined by regular expression: A) (a + b)*bbb B) abbb(a + b)* C) (a + b)*(bbb)(a + b)* D) (a + b)(bbb)(a + b)*	L3

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25.	Which variable does not drive a terminal string in grammar? $S \rightarrow AB$ $A \rightarrow a$ $B \rightarrow b$ $B \rightarrow C$ A) A B) B C) S D) C	L2
26.	Which of the following sentences can be generated by $S \rightarrow aS \mid bA$ $A \rightarrow d \mid cA$ A) bccdd B) abbcca C) abcabc D) abcd	L3
27.	Given the following grammars: G_1 : $S \rightarrow AB \mid aaB$ $A \rightarrow aA \mid \epsilon$ $B \rightarrow bB \mid \epsilon$ G_2 : $S \rightarrow A \mid B$ $A \rightarrow aAb \mid ab$ $B \rightarrow abB \mid \epsilon$ Which of the following is correct? A) G_1 is ambiguous and G_2 is unambiguous grammars B) G_1 is unambiguous and G_2 is ambiguous grammars C) both G_1 and G_2 are ambiguous grammars D) both G_1 and G_2 are unambiguous grammars	L2
28.	Pushdown automata can recognize language generated by_____. A) Only context free grammar B) Only regular grammar C) Context free grammar or regular grammar D) Only context sensitive grammar	L2
29.	To obtain a string of n Terminals from a given Chomsky normal form grammar, the number of productions to be used is: A) $2n - 1$ B) $2n$ C) $n + 1$ D) n^2	L2

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30.	Match the following:					
	<p align="center">List - I</p> <p>(a) Context free grammar</p> <p>(b) Regular grammar</p> <p>(c) Context sensitive grammar</p> <p>(d) Unrestricted grammar</p> <p>Codes:</p> <p>(a) (b) (c) (d)</p> <p>(A) (ii) (iv) (iii) (i)</p> <p>(B) (ii) (iv) (i) (iii)</p> <p>(C) (iv) (i) (ii) (iii)</p> <p>(4) (i) (iv) (iii) (ii)</p> <p>A) (A) B) (B) C) (C) D) (D)</p>	<p align="center">List - II</p> <p>(i) Linear bounded automaton</p> <p>(ii) Pushdown automaton</p> <p>(iii) Turing machine</p> <p>(iv) Deterministic finite automaton</p>				L2
31.	Context sensitive language can be recognized by a :	A) Finite state machine	B) Deterministic finite automata	C) Non-deterministic finite automata	D) Linear bounded automata	L2
32.	The set $A = \{ 0^n 1^n 2^n \mid n=1, 2, 3, \dots \}$ is an example of a grammar that is	A) Context sensitive	B) Context free	C) Regular	D) None of the above	L1

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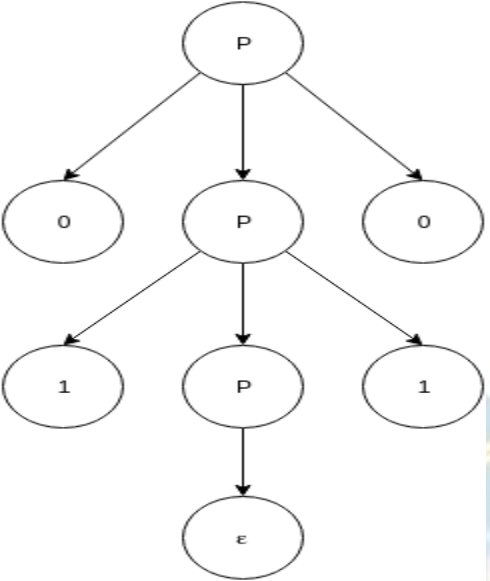
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33.	Production Rule: $aAb \rightarrow agb$ belongs to which of the following category? A) Regular Language B) Context free Language C) Context Sensitive Language D) Recursively Enumerable Language	L2
34.	The Grammar can be defined as: $G=(V, \Sigma, p, S)$ In the given definition, what does S represents? A) Accepting State B) Starting Variable C) Sensitive Grammar D) None of these	L2
35.	Which of the following statement is correct? A) All Regular grammar are context free but not vice versa B) All context free grammar are regular grammar but not vice versa C) Regular grammar and context free grammar are the same entity D) None of the mentioned	L2
36.	$A \rightarrow aA \mid a \mid b$ The number of steps to form aab: A) 2 B) 3 C) 4 D) 5	L3
37.	The language accepted by Push down Automaton: A) Recursive Language B) Context free language C) Linearly Bounded language D) All of the mentioned	L2
38.	The most suitable data structure used to represent the derivations in compiler: A) Queue B) Linked List C) Tree D) Hash Tables	L2
39.	Which of the following statement is false in context of tree terminology? A) Root with no children is called a leaf B) A node can have three children C) Root has no parent D) Trees are collection of nodes, with a parent child relationship	L2
40.	In which order are the children of any node ordered? A) From the left B) From the right C) Arbitrarily D) None of the mentioned	L2

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41.	<p>Which of the following does the given parse tree correspond to?</p>  <p>A) P->1100 B) P->0110 C) P->1100ε D) P->0101</p>	L3
42.	<p>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</p>	L2
43.	<p>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</p>	L2
44.	<p>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</p>	L2
45.	<p>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</p>	L2

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46.	A push down automata is said to be _____ if it has at most one transition around all configurations. A) Finite B) Non regular C) Non-deterministic D) Deterministic	L2
47.	A push down automata can represented using: A) Transition graph B) Transition table C) ID D) All of the mentioned	L2
48.	The instantaneous PDA is has the following elements A) State B) Unconsumed input C) Stack content D) All of the mentioned	L2
49.	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	L2
50.	The symbol Z0 in formal definition of PDA is used for A) Stack symbol B) Input symbol C) Both (a) and (b) D) None of these	L2

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