INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

INFORMATION TECHNOLOGY

DEFINITIONS AND TERMINOLOGY QUESTION BANK

Course Name	:	**THEORY OF COMPUTATION**
Course Code	:	**AITB03**
Program	:	**B.Tech**
Semester	:	**IV**
Branch	:	**Computer Science and Engineering**
Section	:	**A,B,C & D**
Academic Year	:	**2019 – 2020**
Course Faculty	:	**Mr. P Anjaiah, Assistant Professor** **Ms. A Jayanthi, Assistant Professor** **Ms. Uma Shankari, Assistant Professor** **Ms. Ramya Sree, Assistant Professor**

OBJECTIVES:

I	To help students to consider in depth the terminology and nomenclature used in the syllabus.
II	To focus on the meaning of new words / terminology/nomenclature

DEFINITIONS AND TERMINOLOGY QUESTION BANK

S.No	QUESTION	ANSWER	Blooms Taxonomy Level	CO	CLO Code
UNIT-I					
1	Write the specification of DFA.	DFA is mathematically represented as a 5-uple (Q, Σ, δ, q_0, F) 1. Q - finite set of states 2. Σ - finite set of input symbols 3. δ - transition function that takes as argument a state and a symbol and returns a state 4. q_0 - start state 5. F-set of final or accepting statesThe transition function δ is a function in $Q \times \Sigma \rightarrow Q$	Remember	CO 1	AITB03.02
2	Define transition diagram.	A diagram consisting of circles to represent states and directed line segments to represent transitions between the states. One or more actions (outputs) may be associated with each transition. The diagram represents a finite state machine.	Remember	CO 1	AITB03.02
3	Construct the language that accepts the string of length 3 over alphabet Σ= {a,b}.	L={aaa,aba,aab, abb, baa, bab, bba, bbb}.	Remember	CO 1	AITB03.02

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4	Define ε-NFA.	We extend the class of NFAs by allowing instantaneous (ε) transitions: 1. The automaton may be allowed to change its state without reading the input symbol. 2. In diagrams, such transitions are depicted by labeling the appropriate arcs with ε. 3. Note that this does not mean that ε has become an input symbol. On the contrary, we assume that the symbol ε does not belong to any alphabet.	Remember	CO 1	AITB03.03
5	Define ε closure.	Epsilon means present state can go to other state without any input. This can happen only if the present state have epsilon transition to other state. Epsilon closure is finding all the states which can be reached from the present state on one or more epsilon transitions.	Understand	CO 1	AITB03.02
6	Write the specification of NFA.	So a DFA is mathematically represented as a 5-Tuple ($Q, \Sigma, \delta, q_0, F$) 1. Q- finite set of states 2. Σ - finite set of input symbols 3. δ- transition function that takes as argument a state and a symbol and returns a state 4. q_{0} - start state 5. F-set of final or accepting statesThe transition function δ is a function in $Q \times \Sigma \rightarrow 2^Q$	Remember	CO 1	AITB03.03
7	Write the specification of NFA- ε.	So a DFA is mathematically represented as a 5-uple ($Q, \Sigma, \delta, q_0, F$) 1. Q- finite set of states 2. Σ - finite set of input symbols 3. δ- transition function that takes as argument a state and a symbol and returns a state 4. q_{0} - start state 5. F-set of final or accepting statesThe transition function δ is a function in $Q \times \Sigma$ $U\{\varepsilon\} \rightarrow 2^Q$	Remember	CO 1	AITB03.02
8	Construct the language that accepts the string of length 2 over alphabet Σ= {a,b}.	L={aa,ab,ba,bb}.	Remember	CO 1	AITB03.02
9	What is finite language?	The language which contains finite number of strings. Example: Strings of length 2 over alphabet Σ= {a,b} is L={aa,ab,ba,bb}.	Remember	CO 1	AITB03.02
10	What is infinite language?	The language which contains infinite number of strings. Example: Strings of length >=2 over alphabet Σ= {a,b} is L={aa,ab,ba,bb, aaa,aba,…}.	Remember	CO 1	AITB03.02

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11	Construct the language that accepts the string of length 1 over alphabet Σ= {a,b}.	L = {a,b}	Remember	CO 1	AITB03.02
		UNIT-II			
1	Identify the regular set for given regular expression (a+b)*abb	Set of strings of a's and b's ending with the string abb. So L = {abb, aabb, babb, aaabb, ababb, …………..}	Understand	CO 1	AIT002.04
2	Identify the RE for strings which begin or end with either 00 or 11.	The regular expression for begins and ends with 00 or 11 is =[(00+11)(0+1)*] + [(0+1)* (00+11)]	Understand	CO 1	AIT002.04
3	Identify the RE for strings with atleast two c's over the set Σ={c,b}	The regular expression for strings with atleast two c's: (b+c)* c (b+c)* c (b+c)*	Understand	CO 1	AIT002.04
4	Identify the regular set for given regular expression (0+1)*	Any combinations of 0's and 1's. (0+1)*= { Є , 0 , 1 , 01 , 10 ,001 ,101 ,101001, …………………}	Understand	CO 1	AIT002.04
5	Identify the regular set for given regular expression $(0+1)^+$	Any combinations of 0's and 1's. (0+1)*= { 0 , 1 , 01 , 10 ,001 ,101 ,101001, …………………}	Understand	CO 1	AIT002.04
6	Identify the regular expression for even length of string.	Regular expression for even length of string R= ((a+b)(a+b))*	Understand	CO 1	AIT002.04
7	Identify the regular expression for odd length of string.	Regular expression for odd length of string R= ((a+b)(a+b))*(a+b)	Understand	CO 1	AIT002.04
8	Identify the regular expression for all strings	Regular expression for all strings beginning with '11 ' and ending with 'ab'. R= 11(1+a+b)* ab	Understand	CO 1	AIT002.04

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	beginning with '11 ' and ending with 'ab'.				
9	Identify the regular expression for every string will have atleast one 'a' followed by atleast one 'b'.	The regular expression for every string will have atleast one 'a' followed by atleast one 'b'. $R=a^+b^+$	Understand	CO 1	AIT002.04
10	State the operations of regular expressions	The operations of regular expressions are Union, concatenation and kleen closure.	Remember	CO 1	AIT002.04
11	Identify the regular expression for set of all strings over {a,b}with 3 consecutive b's.	the regular expression for set of all strings over {a,b}with 3 consecutive b's. R.E: (a+b)* bbb (a+b)*	Understand	CO 1	AIT002.04
12	State Left distributive law in identity rules	Left distributive law is P (Q +R) = PQ + PR	Understand	CO 1	AIT002.04
13	State Right distributive law in identity rules	Right distributive law is (Q +R)P = QP + RP	Understand	CO 1	AIT002.04
14	Identify the properties under which regular languages are not closed.	Subset, superset, infinite union and infinite intersection.	Understand	CO 1	AIT002.04
UNIT-III					
1	How many cases are required to obtain CFG for unequal no	a)Only a's are present and number of b's are zero b) Only b's are present and number of a's are zero c)Number of a's are atleast one more than	analyze	CLO10	AIT002

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	of a's and b's?	number of b's d) Number of b's are atleast one more than number of a's			
2	Construct CFG which consist of all the strings having atleast one occurrence of 000?	Production rules are: S→ATA A→0A|1A|£ T→000	Analyze	CLO10	AIT002
3	State the Pumping lemma for Regular languages?	For any regular language L, there exists an integer n, such that for all x ∈ L with $\|x\| \geq n$, there exists u, v, w ∈Σ∗, such that x = uvw, and a) $\|uv\| \leq n$ b) $\|v\| \geq 1$ c) for all i ≥ 0: uviw ∈ L	Analyze	CLO12	AIT002
4	Define useless productions?	The productions that can never take part in derivation of any string , are called useless productions. Similarly , a variable that can never take part in derivation of any string is called a useless variable	Remember	CLO10	AIT002
5	What is Elimination of null productions?	The productions of type 'A -> £' are called £ productions (null productions) . These productions can only be removed from those grammars that do not generate £ (an empty string). It is possible for a grammar to contain null productions and yet not produce an empty string.	Remember	CLO10	AIT002
6	Write the steps required to remove unit productions?	A unit production is a production A -> B where both A and B are non-terminals. Unit productions are redundant and hence should be removed by using following steps a)Select a unit production A -> B, such that there exist a production B -> α, where α is a terminal b)For every non-unit production, B -> α repeat the following step Add production A -> α to the grammar c)Eliminate A -> B from the grammar	understand	CLO10	AIT002
7	Define Derivation tree?	A derivation tree or parse tree is an ordered rooted tree that graphically represents the semantic information a string derived from a context-free grammar.	Remember	CLO10	AIT002
48	List the representation technique for Derivation trees?	Root vertex − Must be labeled by the start symbol. Vertex − Labeled by a non-terminal symbol. Leaves − Labeled by a terminal symbol or ε.	Remember	CLO10	AIT002
9	What is sentential form?	A sentential form is the start symbol S of a grammar or any string in (V ⋃ T)* that can be derived from S. A string of terminals and variables α is called a sentential form if:S => α where S is the start symbol of the grammar	Remember	CLO10	AIT002

S.No	QUESTION	ANSWER	Blooms Taxonomy Level	CO	CLO Code
10	What are the steps for converting CGF to GNF?	a) Convert the grammar into CNF. b) Eliminate left recursion from grammar if it exists. c) c) Convert the production rules into GNF form.	Remember	CLO10	AIT002
11	How many cases are required to obtain CFG for unequal no of a's and b's?	a) Only a's are present and number of b's are zero b) Only b's are present and number of a's are zero c) Number of a's are atleast one more than number of b's d) Number of b's are atleast one more than number of a's	analyze	CLO10	AIT002
UNIT-IV					
1	State the Pumping lemma for Regular languages?	For any regular language L, there exists an integer n, such that for all x ∈ L with $\|x\| \geq n$, there exists u, v, w ∈Σ∗, such that x = uvw, and a) $\|uv\| \leq n$ b) $\|v\| \geq 1$ c) for all $i \geq 0$: $uv^iw \in L$	analyze	CLO12	AIT002
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10	How many cases are required to obtain CFG for unequal no of a's and b's?	a)Only a's are present and number of b's are zero b) Only b's are present and number of a's are zero c)Number of a's are atleast one more than number of b's d) Number of b's are atleast one more than number of a's	analyze	CLO10	AIT002
12	Construct CFG which consist of all the strings having atleast one occurrence of 000?	Production rules are: S→ATA A→0A|1A|£ T→000	analyze	CLO10	AIT002
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		UNIT-V			
1	Variations of Turing machines	Turing machines with two-way infinite tapes Multiple Turing machines Multihued Turing machines Nondeterministic Turing machines Turing machines with two- dimensional tapes	Understand	CLO13	AIT002
2	Define two-dimensional tape?	the Two –Dimensional tape is in tabular format in which the head moves one square up ,down, left or right	Understand	CLO13	AIT002
3	Counter Machine	there are two ways to represent counter machine i) it is similar to the multitask Turing machine but here in place of each stack there is a counter ii) the counter machine is similar to restricted multitask machine	Understand	CLO13	AIT002
4	Turing	the Turing machine with multiple heads can	Understand	CLO13	AIT002

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	machine with multiple heads	have n heads ,but in any state, only one head can move			
5	Non-Deterministic Turing machine	It is similar to NFA. For any state and any input symbol it can take any action from set rather than a definite predetermined action	Understand	CLO13	AIT002
6	Limitations of TM	It cannot decide whether two CFG are equivalent it will not solve halting problem	Understand	CLO13	AIT002
7	Two way infinite tape	a tape has infinite length, the tape head can move either in forward and backward direction	Understand	CLO13	AIT002
8	Computable Languages	The Computable Languages can perform computable functions such as addition, subtraction, division, power function , square function, logarithmic functions and many more.	Understand	CLO13	AIT002
9	Subroutine	subroutine is nothing but a method/ function using which we can construct a TM	Understand	CLO13	AIT002
10	Turing machine	A Turing machine consists of a tape of infinite length on which read and writes operation can be performed. The tape consists of infinite cells on which each cell either contains input symbol ora special symbol called blank. It also consists of a head pointer which points to cell currently being read and it can move in both directions.	Understand	CLO13	AIT002

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