Total Number of Pages:2			**B.TECH**
Time: 2 Hours		**Max marks: 20**	
Mid-Term Examination : 2019-20			
SUBJECT: Formal Language and Automata Theory (FLAT)			
BRANCH: INFORMATION TECHNOLOGY Section-			
Answer Question No.1 which is compulsory and any Three from the rest.			
The figures in the right hand margin indicate marks.			
Q1		Answer the following questions:	(0.5 x 10)
	a)	What is the difference between NFA and DFA	
	b)	Define transition diagram and transition table.	
	c)	Define Pumping Lemma.	
	d)	Explain mealy and Moore machine?	
	e)	What is the difference between positive closure and kleene closure?	
	f)	What is the difference between CFG and CSG?	
	g)	Define Ambiguity.	
	h)	What the difference between left most derivation and right most derivation?	
	i)	Discuss the Chomsky's Hierarchy of Grammars with examples	
	j)	Define Arden's theorem.	
Q2	a)	Design a NFA for the language L = all strings over {0, 1} that have at Least two consecutive 0's or 1's with exampie.	(2.5)
	b)	Design DFA for the language L={w:n a = 1,w€(a,b) * }	(2.5)
Q3	a)	Construct Finite automata for regular expression r = 01*(0+1)*	(2.5)
	b)	Define CNF.Change the following grammar in to CNF. Consider a grammar G= ({S, A, B}, {a, b}, P, S) where S is the start symbol and P is given by S -> bA / aB , A-> bAA / aS / a , B->aBB / bS / a	(2.5)
Q4		Consider the grammar G: (S->S*S/S+S/(S)/S/a/b).Derive the string (a+a*b) from the grammar and test wheather the grammar is ambiguous or not.	(5)
Q5		Construct a grammar in Greibach normal form (GNF) equivalent to the grammar S->AA/a , A->SS/b	(5)

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UPCIT303

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3RD Semester Regular Examination 2019-20

Formal Language and Automata Theory

BRANCH: INFORMATION TECHNOLOGY

Time: 3 Hours

Max Marks: 70

Answer Part-A which is compulsory and any five from Part-B.

The figures in the right hand margin indicate marks.

Part – A (Answer all the questions)

(2 x 10)

Q1 Answer the following questions:

a) Let w be any string of length n is {0,1}*. Let L be the set of all substrings of w. What is the minimum number of states in a non-deterministic finite automaton that accepts L?

b) Differentiate between DFA and NFA.

c) Define a grammar G which represents even palindromes over the input alphabet {0,1}.

d) When a context free grammar is said to be in GNF.

e) Convert the following into CNF.

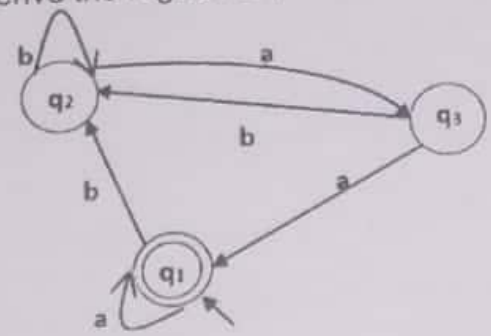
$S \rightarrow bA|aB \quad A \rightarrow bAA|aS|a \quad B \rightarrow aBB|b$

f) Eliminate the epsilon productions.

$S \rightarrow ASa|BbA \qquad A \rightarrow a|d \qquad B \rightarrow d|ad|\in$

g) State Church-Turing hypothesis.

h) Derive the regular expression for the following DFA.



i) What is post correspondence problem?

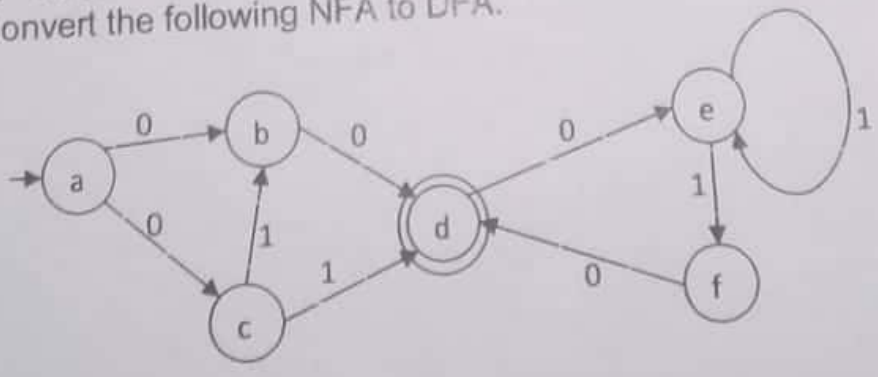
j) Differentiate between recursive and recursively enumerable language.

Part – B (Answer any five questions)

Q2 a) Write down the regular expression which accepts all binary strings divisible by 8. Draw the equivalent DFA. Test whether the string W=10000 is acceptable or not. (5)

(5)

b) Convert the following NFA to DFA.



Q3 a) State the pumping lemma for regular set. Write down the steps needed for proving that the given set is not regular. Using those steps prove that L=$\{a^{2n} | n \geq 1\}$ is regular. (5)

b) Write a regular expression for each of the following sets of binary strings. (5)

i) Has at least 3 characters, and the third character is 0
ii) Number of 0s is a multiple of 3
iii) Starts and ends with the same character
iv) Odd length
v)Starts with 0 and has odd length, or starts with 1 and has even length

Q4 a) Design a push down automation over the input alphabet {a,b} that will accept a language $L = \{wcw^r | w \in \{a, b\}^*\}$ (5)

b) Given the following ambiguous context free grammar (5)

S → Ab | aaB
A → a | Aa
B → b

Find the string s generated by the grammar that has two leftmost derivations. Show the derivations.

Q5 a) i) Find the language of the given Grammar G= {{S},{0,1},{ S→0S, S→S1, S→1,S→0},{S}}. (5)

ii) Find the language of the given Grammar G= {{S},{0,1},{ S→0S, S→S1, S→ ε },{S}}.

Find the language of the given Grammar G={{S},{a,b},{ S→aS | bS | a | b},{S}}

b) Write a short note on Chomsky Classification of Language. (5)

Q6 a) Design a pushdown automation that will accept a language $L = \{a^3 b^{n+1} c^n | n \geq 1\}$ (5)

b) Write down the pumping lemma for context free grammar. Show that the language L={a^p| p is a prime} is not a context free language. (5)

Q7 a) Design a Turing machine M that will accept a language $L(M) = \{0^n 1^n 2^n | n \geq 1\}$ (5)

b) Write down the closure properties of context free language. (5)

Q8 a) Differentiate between P, NP, NP-Complete and NP-Hard problems with suitable example. (5)

b) Write down atleast five closure properties of recursive and enumerable languages. (5)