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ECS403

PAPER ID : 110407

Roll No.

B. Tech.

(SEM. IV) THEORY EXAMINATION, 2014-15

THEORY OF AUTOMATA & FORMAL LANGUAGES

Time : **3** Hours]   [Total Marks : **100**

Note : Attempt all questions. All questions carry equal marks.

1   Attempt any four parts of the following.   **5x4=20**

(a)   Let L_1 be some language over Σ and $L_2 = \Phi$.
        Then prove that
        (i) $L_1.L_2 \neq L_1$ (ii) $L_1 + L_2 \neq \Phi$

(b)   For regular expression prove that, $(a+b)^* \neq a^* + b^*$

(c)   Construct a DFA accepting all strings over alphabet
        set $\Sigma = \{0,1\}$ that are ended with 00.

(d)   Describe the language to the given regular
        expression
        $(1+01)^*(0+01)^*$

(e)   Define the language of a NFA with ε-moves.

(f)   Describe the language accepted by the following
        finite automaton.

State	Input Symbol	
	a	b
$\rightarrow$P	Q	R
*Q	R	P
R	R	R

2 Attempt any two parts of the following. **10x2=20**

(a) What is a regular expression? Construct a DFA for the regular expression $(00+001)*1$.

(b) Prove that the given set of language is not regular.

$L = \{0^n\ 1\ 0^n\ |n \geq 1\}$

(c) Describe the closure properties of regular languages. Prove that regular languages are closed under complementation.

3 Attempt any two parts of the following. **10x2=20**

(a) Construct the context free language (CFL) for the language $\{a^n\ b^n\ |n \geq 0\}$.

(b) Prove that the given language L is derived from a context free grammer.

$L = \{a^i\ b^j\ c^j\ |\ i,\ j \geq 1\}$

(c) (i) Show that the CFG with productions

$S \rightarrow a\ |S\ a\ |b\ S\ S\ |S\ S\ b\ |\ S\ b\ S$

is ambiguous.

(ii) Prove that every regular language is a CFL.

4 Attempt any two parts of the following. **10x2=20**

(a) Define a push down automation (PDA). Describe the language of a PDA.

(b) Construct the PDA for the language $L=wcw^R\ |w$ in $\{a,b\}$, where R stands for reverse string.

(c) Let G be a CFG and its language is L(G). How do you decide that L (G) is finite ?

5 Attempt any two parts of the following.　　　**10x2=20**

(a) Define a Turing machine. Construct a Turing machine for the language

L={w c w | {a,b}*}

(b) Construct a Turing machine for the integer function that computes addition of two integers, i.e., if x and y are two integers then f(x,y) =x+ y.

(c) Define the recursive language. Do you agree that every recursive language is recursive enumerable? Justify your answer.

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