LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION - **MATHEMATICS**

THIRD SEMESTER – **NOVEMBER 2013**

MT 3964 - FORMAL LANGUAGES AND AUTOMATA

Date : 12/11/2013 Dept. No. Max. : 100 Marks

Time : 9:00 - 12:00

ANSWER ALL QUESTIONS

I a) Construct a finite automaton to accept set of all strings over {0, 1} ending with 00

[OR]

b) Construct a finite automation accepting the set $L=\{a^n b^m / m,n\geq 1\}$ (5)

c) i)Let L be a set accepted by a nondeterministic finite automaton. Then prove that there exists a deterministic finite automaton that accepts L.

. ii) State and prove pumping lemma. (15)

[OR]

d) i) Let r be a regular expression. Then prove that there exists an NFA with $\in$ - moves that accepts L(r).

ii) Construct an NFA for the regular expression **11(0 +01)* + 00(1 1)*.** (10+5)

II a) Prove that L = { 0^p / p is a prime number} is not regular.

[OR]

b) Prove that if $L_1=\{+,0\}$ and $L_2=\{\alpha,\delta\}$. Find L_1L_2 and L_1^3.

c) i)Let L_1 = **(0 + 1)*0** and L_2 =**1(0 + 1)*.** Construct an automaton to accept $L_1 \cap L_2$.

ii) Construct a grammar to generate $L=\{a^n b^n c^n / n\geq 1\}$. (8 + 7)

[OR]

d) Minimize the following automation.

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	0	1
$\rightarrow$A	B	C
B	D	E
C	F	G
*D	D	E
E	F	G
*F	D	E
*G	F	G

(15)

III a) Construct a grammar to generate $L=\{0^n1^n / n\geq 1\}$.

[OR]

b) Eliminate $\in$-productions in the grammar with production rules
$S \to AB, A \to aAA / \in, B \to bBB / \in$. . (5)

c)i) Construct a grammar to generate all odd numbers less than 1000.
ii) Find a grammar in CNF equivalent to a grammar whose productions are
$S \to 1A/0B,\ A \to 1AA/0S/0,\ B \to 0BB/1S/1$ with 0, 1 as terminals (7+8)

[OR]

d) Reduce the grammar to CNF given that $S \to \sqcup S/[S \supset S]/p/q$ are the productions of G. (15)

IV a) Define a PDA and give an example .

[OR]

b) Define parse trees and give an example. (5)

c) If a PDA A accepts L by empty stack then prove that there exists another PDA B accepting L by final state . [OR]

d) Construct a PDA that accepts L = { $wcw^R / w \in (0+1)*$ } by
i) empty stack.
ii) final state.

(7 + 8)

V a) Discuss about moves between the ID of the Turing Machine.

[OR]

b) Discuss about the codes of a Turing Machine.

(5)

c) Design a TM to accept the language L = { $0^n1^n2^n$ / n ≥ 1}.

[OR]

d) Design a TM to perform proper subtraction. (15)

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