LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – **MATHEMATICS**

THIRDSEMESTER – APRIL 2018

MT 3964- FORMAL LANGUAGES AND AUTOMATA

Date: 05-05-2018 Dept. No. Max. : 100 Marks

Time: 09:00-12:00

ANSWER ALL QUESTIONS

I a) Design a DFA to accept all positive integers divisible by 100.

[OR]

b) Construct NFA accepting binary strings with two consecutive 0's. (5)

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

ii) Write an NFA with $\in$- moves to accept **(1* + 10*0)*** . (8+7)

[OR]

d)i) Enumerate the differences between DFA and NFA.

ii) Construct DFA equivalent to the following NFA.

	0	1
$\rightarrow q_0$	$\{q_0, q_1\}$	ϕ
q_1	ϕ	$\{q_1, q_2\}$
$*\ q_2$	ϕ	ϕ

(5+10)

IIa) State and prove pumping lemma.

[OR]

b) Show that a intersection of two regular languages is regular. (5)

c)i) If L is accepted by a NFA with $\in$- transaction then show that L is accepted by a NFA without $\in$-transection.

ii) Show that **(0*1*)* = (0 +1)***. (8 + 7)

[OR]

d) Minimize the following automaton.

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

(15)

III a) Construct a grammar to generate all five digit positive even integers.

[OR]

b) Write a grammar to generate $L = \{ww^R / w \in (a,b,c)^*\}$. (5)

c i) Discuss about elimination of unit productions and give an example.

ii) Write about Chomskey's Hierarchy of grammars. (7+8)

[OR]

d i) Eliminate the useless symbols from the grammar with the following production rules S→aA/ a / Bb /cC, A→aB, B→a / Aa, C→cCD, D→ddd

ii) Write about CNF. Convert the grammar with productions S →aABA A→abABa /a, B→BAa / b into CNF. (5+10)

IV a) Define ambiguous grammar and give an example.

[OR]

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

c) If a language L is accepted by a PDA A by final state then prove that there exist a PDA B accepts the same language L by empty stack. (15)

. [OR]

d) Design a PDA to accept the set $L = \{wcw^R / w \in (0,1)^*\}$ by

(1) Empty stack.

(2) Final state. (10 + 5)

V a) Define a Turing Machine and moves of a Turing Machine.

[OR]

b) Write about any two programming techniques of a Turing machine . (5)

c) Design a TM to to accept $L = \{0^n 1^n 2^n / n \geq 1\}$.

[OR]

d) Design a Turing Machine for multiplication. (15)

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