 LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

SECOND SEMESTER – **APRIL 2012**

# MT 2960 - FORMAL LANGUAGES AND AUTOMATA

Date : 26-04-2012 Dept. No. Max. : 100 Marks

Time : 9:00 - 12:00

**ANSWER ALL QUESTIONS**

I a) Construct a finite automation that accepts exactly those input strings of 0’s and1’s

that end in 111.

[OR]

b) Construct a DFA accepting all strings in (0 + 1)\* having odd number of zeros. (5)

c) i)Let L be a set accepted by a nondeterministic finite automation. Then prove

that there exists a deterministic finite automation that accepts L.

ii)Write a note on Epsilon-Closure and give an example. (10+5)

[OR]

d) i)Let r be a regular expression. Then prove that there exists an NFA with

- transitions that accepts L(r).

ii) An NFA has moves.

Find an equivalent DFA. (8+7)

II a) Prove that L = { / *n* is an integer, *n*  1} is not regular.

[OR]

b) State and prove pumping lemma. (5)

1. Minimize the following automation.

|  |  |  |
| --- | --- | --- |
|  | 0 | 1 |
| A | B | C |
| B | D | E |
| C | F | G |
| D | D | E |
| E | F | G |
| \*F | E | D |
| \*G | G | F |

[OR]

d)i) State and prove any three closure properties of regular languages.

ii) Construct an equivalent DFA for the following NFA

|  |  |  |
| --- | --- | --- |
|  | a | b |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

(15)

III a) Construct a grammar generating all palindromes over {0, 1}.

[OR]

b) Construct a grammar to generate L = { / *n* is an integer, *n*  1} (5)

1. Write GNF grammar for for the following set of production rules

, 

[OR]

d) Consider a grammar with production rules

. The terminals

are Derive an equivalent grammar in CNF (15)

IV a) Define a PDA and give an example.

[OR]

b) Construct a PDA that accepts {/ *n*  1} by empty stack (5)

c) If a PDA A accepts L by empty store then prove that there exists another PDA

B accepting L by final state.

[OR]

d) Let M be a PDA with  as (q0, 0,Z0) = {( q0, XZ0)}, (q0, 0,X) = {( q0, XX)}

(q0, 1,X) = {( q1, )}, (q1, 1,X) = {( q1, )}, (q1, ,X) = {( q1, )},

(q1,,Z0) = {( q1, )}. Construct a CFG generating N(M). (15)

V a) Design a Turing Machine to add two positive integers. .

[OR]

b) Design a Turing Machine to compute . (5)

c) Design a TM to accept the language L = { }

[OR]

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

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