 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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