Printed Pages : 4

NMCA214

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 214221

Roll No.

MCA

(SEM. II) THEORY EXAM. 2014-15

INTRODUCTION TO AUTOMATA THEORY AND LANGUAGES

Time : 3 Hours] [Total Marks : 100

Note : Attempt the questions as indicated.

Q1. Attempt any ***four*** questions from the following : 5x4=20

a) Let L_1 and L_2 be two language sets then compute $L_1 + L_2$, if $L_2 = \varepsilon$ (null string).

b) Construct a NFA that accepts the set of all strings containing at least two 0's where $\sum = \{0,1\}$.

c) Define a NFA and compute its language.

d) Prove that $(111^*)^* = (11 + 111)^*$.

e) Construct a NFA with ε -moves for the regular expression $(01)^*(0+1)^*$.

f) Show that if L is a regular language, then L^n is regular for $n \geq 0$.

Q2. Attempt any ***two*** questions from the following : 10x2=20

a) Define regular expression. Describe the language denoted by the regular expression $(0 + 1)^* 1^* (0 + 1)^*$.

b) Let $\sum = \{0,1\}$, then prove that $L = \{0^i 1 1^j \mid j$ is a multiple of i$\}$ is not regular.

c) Prove that complement of a regular language is closed.

Q3. Attempt any ***two*** questions from the following : 10x2 20

a) Find the CFG for the language $L = \{a^i b^j c^k \mid i = j \text{ or } i = k\}$.

b) Show that the language $L = \{0^n 1^m \mid m = n^2\}$ is not a CFL.

c) Show that the grammar is ambiguous and find an equivalent unambiguous grammar.

$S \rightarrow SS \mid a \mid b$

Q4. Attempt any ***two*** questions from the following : 10x2=20

a) What is a push down automaton (PDA)? Describe the acceptance of a PDA.

b) Construct the PDA for the language $L = \{w\, w^R \mid w \text{ in } \{0, 1\}^*\}$, where R stands for reverse string.

c) Prove that $L = \{a^n b^{2n} a^n \mid n \geq 0\}$ is not a CFL.

Q5. Attempt any ***two*** questions from the following : 10x2=20

a) Draw a transition diagram for a Turing machine accepting the language $\{a^n b^n c^n \mid n \geq 0\}$.

b) Write a short note on any ***one*** of the following :

(i) Rice's Theorem

(ii) *P* and NP class of problems

c) Define the recursive enumerable language. Disprove that the complement of a recursive enumerable language is closed.
