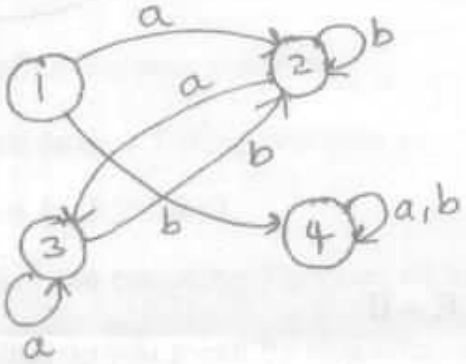
T.E. (Comp.) (Semester – V) (RC) Examination, November/December 2010
AUTOMATA LANGUAGE AND COMPUTATION

Duration: 3 Hours Total Marks : 100

Instructions : *1) Attempt **any five** questions, choosing at least **one** from **each** Module.*
*2) Figures to the **right** indicate marks.*

MODULE – I

1. a) Check whether the string "abaaba" is accepted by the following DFA. 3

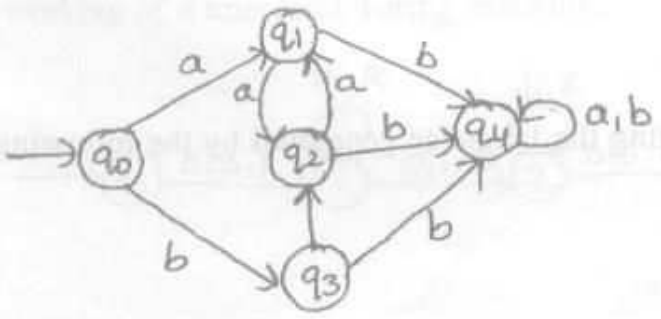


b) Define : 4
i) Moore machine
ii) Deterministic Finite Automata.

c) Show that $L = \{a^{n!} \mid n \geq 0\}$ is not regular. 6

d) What do you mean by distinguishable strings ? Let L = {x|x end's in 10}. Show that 00 and 01 are distinguishable with respect to L. 7

2. a) Minimize the following DFA, where qo, is the start state. 6



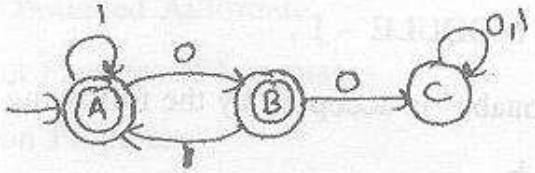
q_4 is the accepting state.

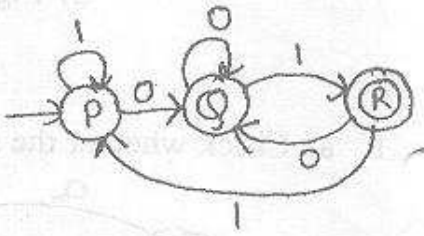
P.T.O.

b) Prove using mathematical induction. 6

$$\sum_{i=1}^{n} \frac{1}{i(i+1)} = \frac{n}{n+1} \quad \forall\, n \geq 0.$$

c) Explain substitutions and Homomorphism using examples. 4

d) $M_1 =$ 

$M_2 =$ 

find i) $L_1 \cup L_2$ ii) $L_1 - L_2$

If M_1 accepts L_1 and M_2 accepts L_2. 4

MODULE – II

3. a) Define Context Free Grammar. 2

b) Show that the following grammar is ambigous

$S \rightarrow iCtS \mid iCtSeS \mid a$

$C \rightarrow b$

$V = \{S, C\}\ \Sigma = \{i, t, e, a, b\}$. 5

c) Convert the following grammar to CNF. 8

$S \rightarrow AACD$

$A \rightarrow aAb \mid \in$

$C \rightarrow aC \mid a$

$D \rightarrow aDa \mid bDb \mid \in$

d) Construct a DPDA accepting the language generated by the following grammer. 5

$S \rightarrow SS \mid [S] \mid \{S\} \mid \in$

4. a) Prove that if L_1 and L_2 are Context Free Languages then prove that $L_1 \cup L_2$ is also context free. 8

   b) Write context free grammar equivalent to a regular expression. 4

   $(0+1)^*(1+0)^*$

   c) What is an ambigious grammar ? How will you prove that the grammar is ambigious show with the help of an example. 6

   d) Define Push Down Automata. 2

MODULE – III

5. a) Define Turning machine. 2

   b) Construct a Turing machine to accept the strings of the language

   $L = \{a, b\}^*\{aba\}$. 6

   c) Give the encoding Function of Universal Turing machine. 8

   d) What do you mean by characteristics function of a set ? Explain how a Turing machine relates to this function. 4

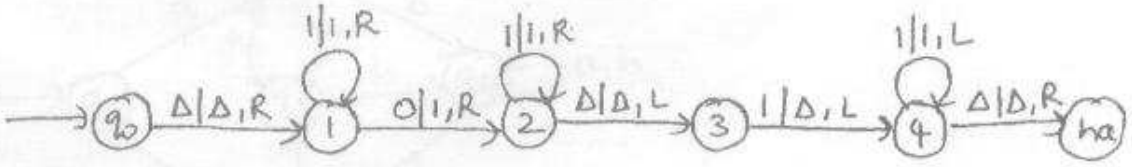
6. a) Construct a Turing Machine for accepting $L = \{a^n b^n \mid n \geq 1\}$. 6

   b) Define : 4

   i) Universal Turing machine

   ii) Partial function computation.

   c) Encode the following Turing machine using encoding function. Explain the working of a universal Turing machine. 10



MODULE – IV

7. a) Obtain a generalized sequential machine that maps. 6

$L_1 = \{0^n 1^n \mid n \geq 1\}$ to $L_2 = \{a^{2n}b \mid n \geq 0\}$

b) Define : 10

i) Linear Bounded Automata.

ii) Abstract Families of Languages

iii) Decision Problem

iv) Context Sensitive Grammars.

c) State the Chomsky Hierarchy. 4

8. a) Obtain a context sensitive Grammar for the Language
$L = \{a^i b^i c^i \mid n \geq 1\}$ 6

b) State :

1) Rice Theorem

2) Unrestricted Grammer.

3) Reducing one Language to another. 6

c) "If L_1 and L_2 are recursively enumerable Language over Σ then $L_1 \cup L_2$ is also recursively Language" prove the above statement. 6

d) Define Trio's and full Trio's. 2
