

Total No. of Questions :8]

[Total No. of Printed Pages : 3

Roll No

MCADD-604

M.C.A. (Integrated), VI Semester

Examination, November 2023

Theory of Computation

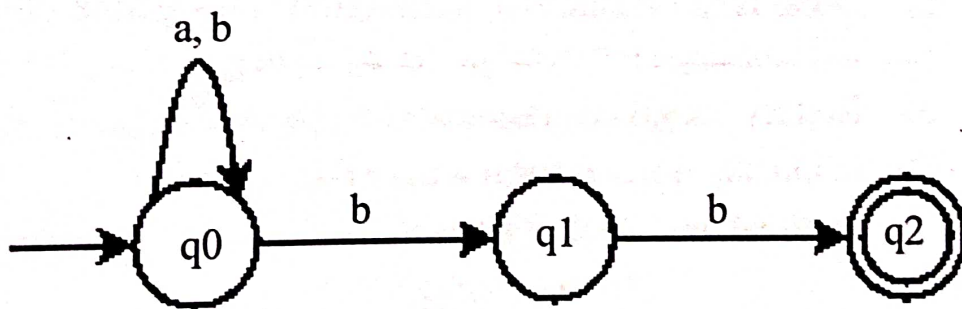
Time : Three Hours

Maximum Marks : 70

Note: i) Attempt any five questions.

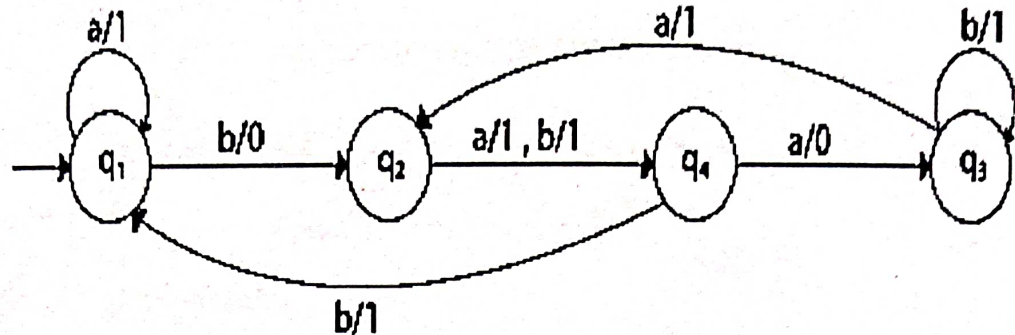
ii) All questions carry equal marks.

1. a) Design the DFA of the following language over $\{0,1\}$:
 - i) All strings with Even no. of 0's and even no. of 1's.
 - ii) All strings of length at most 3.
- b) Differentiate Between NFA and DFA. Convert the following NFA to equivalent DFA.



2. a) Design a NFA for the language L which accepts all the string in which the third symbol from right side is always 'a' over input $\{a, b\}$. Also write the regular expression for this language.

- b) Differentiate Mealy and Moore machine with example. Convert the given Mealy machine as shown in fig. into Moore Machine.



3. a) Let $\Sigma = \{a, b\}$. For each of the following languages over Σ , find a regular expression representing it:
- All string that exactly contain one 'a'.
 - All string beginning with 'ab'.
 - All string that contains either the sub-string 'aaa' or 'bbb'.
- b) State pumping lemma for regular set. Show that the set $L = \{a^p \mid p \text{ is prime number}\}$ is not regular.
4. a) What is the Pushdown automaton? Design the PDA for the language $L = \{wcw^r \mid w \in \{a, b\}^*\}$.
- b) Reduce the given grammar $G = (\{S, A, B\}, \{a, b\}, P, S)$ to Chomsky normal form where P is
- Defined as: $S \rightarrow bA \mid aB$
 $A \rightarrow bAA \mid aS \mid a$
 $B \rightarrow aBB \mid bS \mid b$
5. a) Define Turing Machine. Design a Turing Machine that can compute Proper Addition i.e. $m+n$, Where m and n are positive integer.
- b) State Halting problem of Turing machine.

6. a) Show that if L_1 and L_2 are recursive language, then $L_1 \cup L_2$ and $L_1 \cap L_2$ are also recursive.
- b) What is Undecidability? Describe post correspondence problem.
7. Write short notes on any four of the following:
- a) Linear Bounded Automata
 - b) GNF
 - c) Chomsky classification
 - d) Context sensitive grammar
 - e) Recursively enumerable sets
8. a) Design finite automaton of the following regular expression:
 $(a+b)^*a+b$
- b) How P class is different from NP class.
