

K-1007

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[Roll No.]

MCS-E13/MCA-E4

**MCA IVth Semester
Examination Dec., 2023**

FORMAL LANGUAGE AND AUTOMATA

Time : 2 Hours]

[Max. Marks : 70

Note :- This paper is of Seventy (70) marks divided into two (02) Sections 'A' and 'B'. Attempt the questions contained in these Sections according to the detailed instructions given there in. Candidates should limit their answers to the questions on the given answer sheet. No additional (B) answer sheet will be issued.

Section-A

(Long Answer Type Questions) 2×19=38

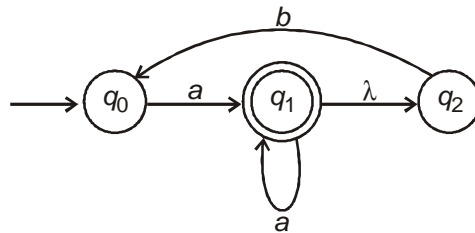
Note :- Section 'A' contains Five (05) Long-answer type questions of Nineteen (19) marks each. Learners are required to answer any two (02) questions only.

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(1)

P.T.O.

1. (a) Define deterministic finite automaton. Let $\Sigma = \{a, b\}$ then design a DFA that accepts all the strings that starts with a and terminates in ab . (10)
- (b) Define concatenation, reversal and star closure of a language. (9)
2. (a) Define a non-deterministic finite automaton. Convert the following NFA into an equivalent DFA : (10)



- (b) Define a regular expression. Write regular expressions for the following languages over $\Sigma = \{a, b\}$. (9)
 - (i) Set of all the words starting with a .
 - (ii) Set of all the words terminating with abb .
3. (a) Define Mealy machine. Let $\Sigma = \{0, 1\}$ and $\Gamma = \{a, b, c\}$ design a Mealy machine that provides an output caab for the input 1010. (10)
- (b) Define a pushdown automaton. (9)

4. (a) Define context free languages and context free grammar with the help of suitable example. (10)
- (b) Describe pumping lemma for context free languages. (9)
5. (a) Define a Turing machine, instantaneous description and moves in Turing machine. (10)
- (b) Describe post correspondence problem with the help of a suitable example. (9)

Section–B

(Short Answer Type Questions) 4×8=32

Note :- Section 'B' contains Eight (08) Short-answer type questions of Eight (08) marks each. Learners are required to answer any *four* (04) questions only.

1. Define the grammar of formal languages. Write the grammar for the language that contains all the words starting with a over the alphabet $\Sigma = \{a, b\}$.
2. Differentiate between deterministic and non-deterministic finite automaton.
3. Construct a DFA for the regular expression $(a + b)a^*ba$.
4. Describe recursive and recursively enumerable languages.

5. What do you mean by parsing ? Define top down and bottom-up parsing.
6. Define Chomsky normal form and Greibach normal form.
7. Describe the closure properties of context free languages.
8. Define computability and decidability.
