62454

Reg. No. | | | | | | | | | |

I Semester M.C.A. Degree Examination May/June - 2025
COMPUTER APPLICATIONS
Theory of Computation
(CBCS 2020-21 Scheme)
Paper : 1MCA4

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates :

1) Answer any **five** questions from Section - A, each question carries **6** marks.
2) Answer any **four** questions from Section-B, each question carries **10** marks.

SECTION - A

Answer any **Five** of the following questions. Each question carries **6** marks. **(5×6=30)**

1. Differentiate between DFA, NFA and $\in -NFA$.
2. Design a DFA that accepts binary strings divisible by 5. Verify the string "1101" is accepted or not.
3. Define Regular expression. Show that the language $L = \{ww | w \in \{a,b\}^*\}$ is not regular.
4. What you mean by ambiguity of grammar? Check whether below grammar is ambiguous

   $S \rightarrow aY | bX$

   $X \rightarrow aS | bXX | a$

   $Y \rightarrow bS | aYY | b$

   On string "aabbab"
5. Briefly explain Universal languages and Linear Bounded Automata.
6. What is Turing machine? Explain different types of Turing machines.
7. Simplify the following grammar by eliminating left recursion

   $S \rightarrow Ab | a$

   $A \rightarrow Ab | Sa$
8. Prove that complement of recursively enumerable language is recursive.

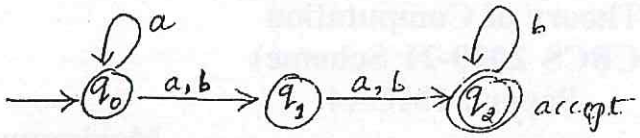
[P.T.O.

SECTION - B

Answer any **Four** of the following questions. Each question carries **10** marks.**(4×10=40)**

9. a) What is Finite Automata? Explain the applications of finite automata. **(4)**

b) Convert the following NFA to equivalent DFA. **(6)**



10. a) Obtain an NFA which accepts strings of a's & b's starting with string "ab". **(5)**

b) Show that regular languages are closed under union, concatenation and star operations. **(5)**

11. a) Convert the following CFG to CNF **(6)**

$S \rightarrow 0A|1B$

$A \rightarrow 0AA|1S|1$

$B \rightarrow 1BB|0S|0$

b) Write a note on Mealy and Moore machine. **(4)**

12. a) What is PDA? Obtain a PDA to accept the Language $L = \{0^n 1^n | n \geq 1\}$ by a final state. Verify the string "000111" is accepted or not. **(7)**

b) Briefly explain Instantaneous Description of PDA. **(3)**

13. Design a Turing machine to accept the language $L = \{0^n 1^n | n \geq 1\}$ and verify the string "0011" is accepted or rejected. **(10)**

14. Write a note on:

a) Pumping Lemma for regular languages.

b) Halting problem in Turing machine. **(5+5)**