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Reg. No.

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I Semester M.C.A. Degree Examination, June/July- 2023

COMPUTER SCIENCE

Theory of Computation

(CBCS Y2k20 Scheme (2020-2021))

Paper : 1MCA4

Time : 3 Hours

Maximum Marks : 70

Instructions to candidates:

- 1) Answer any **Five** full questions from Part - A. Each question carries **Six** marks.
- 2) Answer any **Four** full questions from Part - B. Each question carries **Ten** marks.

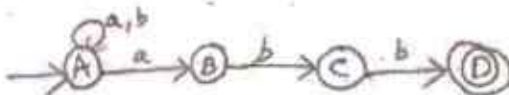
PART - AAnswer any **Five** of the following. Each question carries **Six** Marks. (5×6=30)

1. Define Finite Automata. Compare DFA, NFA with suitable examples.
2. Draw a DFA to accept strings of a's and b's ending with abb, and also show that strings bbabb, aaabb are accepted by the DFA.
3. What is Regular expression? Construct FA for the Regular expression $00^* + 1$.
4. Define Derivation Tree and also show that following grammar is ambiguous $S \rightarrow aSbS/bSaS \in$
5. Define PDA? Explain PDA model with graphical representation.
6. What are Moore and Mealy machines? Explain Difference between them.
7. Define Turing Machine. Explain halting programming techniques for TM.
8. State and prove that the Union of two recursive languages is recursive.

PART - BAnswer any **Four** full questions of the following. Each question carries **Ten** marks.

(4×10=40)

9. a) Convert the following NFA to equivalent DFA. (7)



- b) Discuss the Applications of Finite Automata. (3)

[P.T.O.]



10. a) Define CNF. Convert the following CFG to CNF
- $$\begin{aligned} S &\rightarrow 0A|1B \\ A &\rightarrow 0AA|S|1 \\ B &\rightarrow 1BB|0S|0 \end{aligned} \quad (7)$$
- b) Prove that the regular languages are closed under intersection. (3)
11. Define deterministic Pushdown Automata. Design PDA to accept the language $L = \{WCW^R | W \geq 0 \text{ and } W \text{ contains a's and b's}\}$ and also verify if it is DPDA or NPDA. (10)
12. Define instantaneous descriptions for Turing machines. Obtain a Turing machine to accept the language $L = \{0^n 1^n | n \geq 1\}$. Show that the string $W = 001122$ are accepted by TM. (2+6+2)
13. a) Show that $L = \{0^n 1^n | n \geq 1\}$ is not regular. (5)
- b) Explain different types of TM. (5)
14. Write short note on:
- a) Universal languages (5)
- b) Context Sensitive Languages (5)