

Time: 3 hours

Date - 10.12.25

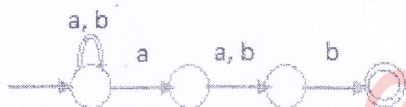
Max. Marks: 80

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- N.B.:** 1) All Question carry equal Marks.
 2) Solve any Four of the six questions.
 3) Assume suitable data if necessary.
 4) Figures to the right indicate full marks.

Q.1) Answer the following questions:

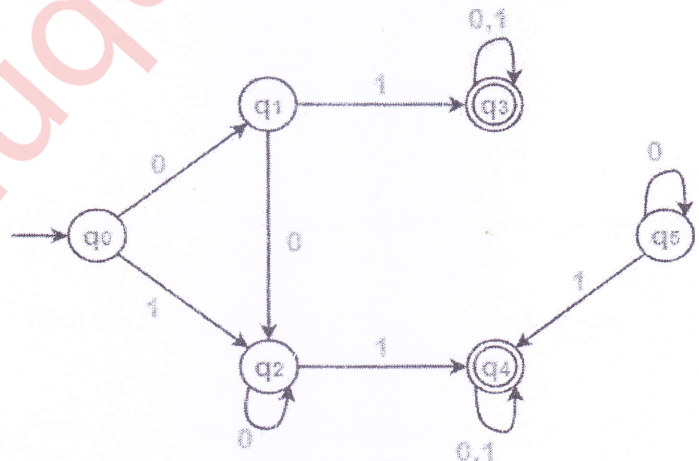
- a. Construct a Deterministic Finite Automata (DFA) for the language accepting strings ending with '0110' over the input alphabets $\Sigma = \{0, 1\}$ [05]
- b. What do you mean by Regular Expression (RE)? Construct RE for all even binary numbers. [05]
- c. Define Non-Deterministic Automata (NFA). Write the language accepted by the NFA given below. [05]



- d. Describe the variants of Turing Machine. [05]

- Q.2) a) What is the need for normalization. Write a note on Greibach Normal Form (GNF) [10]
- b) What are Moore and Mealy machines. Construct a Moore machine that takes a set of all strings over Alphabet $\{0, 1\}$ as input and produces 'A' as output if input ends with (10) or produces 'B' as output if input ends with (11) otherwise produces 'C'. [10]

- Q.3) a) Design Push Down Automata (PDA) for the language $L = \{a^{2n}ba^n | n \geq 0\}$ [10]
- b) Write the steps for Minimization of a DFA. Minimize the DFA given below. [10]



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- Q.4) a) Consider the grammar,
 $S \rightarrow A1B$
 $A \rightarrow 0A | \lambda$
 $B \rightarrow 0B | 1B | \lambda$

Given the string $w=00101$, find a leftmost and rightmost derivations with corresponding parse trees.

- b) Write a note on Chomsky Normal Form (CNF) and convert the following grammar into CNF. [05]

$$S \rightarrow ASB$$

[05]

$$A \rightarrow aAS | a | \epsilon$$

$$B \rightarrow SbS | A | bb$$

- Q.5) a) List some applications of FA, PDA and TM. [10]

- b) Define Turing machine. Design TM for the language, $L = \{a^n b^{2n} : n \geq 1\}$. [10]

- Q.6) Write short notes on (Any TWO): [20]

- Chomsky hierarchy
- Phases of a compiler.
- Halting problem in Turing machine.