B. Tech. Examination, 2024-25

(Odd Semester)

AUTOMATA THEORY

Time : Three Hours] *[Maximum Marks : 60*

Note :– Attempt all questions.

SECTION–A

1. Attempt all parts of the following : 8×1=8

(a) Give the examples/applications designed as fintie state system.

(b) Draw the finite automata that accept a string over (0, 1) having three CS consecutive 0's.

(c) List the closure properties of regular language.

(d) Design a regular expression that accepts all the string for input alphabet {a, b} containing exactly 2 a's.

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(e) Define context free grammar and ambiguity in context to grammar.

(f) Discuss the definition of Push Down Automata (PDA).

(g) What are the features of universal turing machine?

(h) What do you understand by Halting problem?

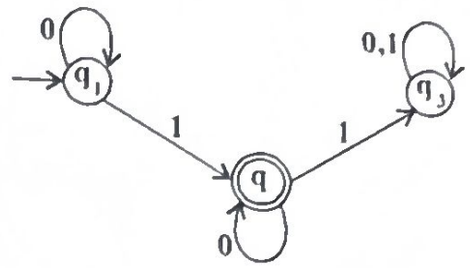
SECTION – B

2. Attempt any two parts of the following : 2×6=12

(a) Construct a minimum state automation equivalent to the fintie automata :

State	0	1
→ q0	q1	q5
q1 (Final State)	q6	q2
q2	q0	q2
q3	q2	q6
q4	q7	q5
q5	q2	q6
q6	q6	q4
q7	q6	q2

(b) Apply Arden's theorem to find the regular expression of the language for given finite automata :



(c) Describe context free grammar and pushdown automata.

(d) Construct a turing machine to convert a binary string to its 1's complement.

SECTION – C

Note :– Attempt all questions. Attempt any two parts from each questions. 8×5=40

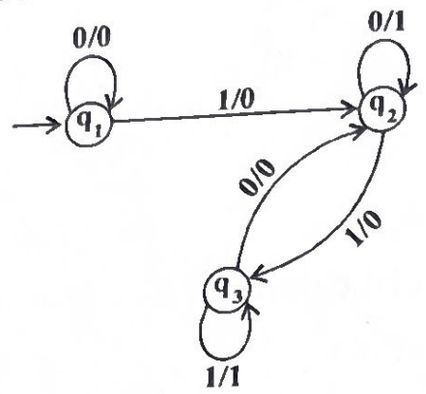
3. (a) Cosntruct a DFA which accept a language of all binary string divisible by 5 over Σ (0, 1).

(b) Give the complete description about the Chomsky hierarchy.

(c) Design a FA to accept the string that always ends with 101.

4. (a) Prove that $L = \{a^i b^i \mid i \geq 0\}$ is not regular.

(b) Construct the given Mealy machine into Moore machine :



(c) State and prove the closure properties of context free language.

5. (a) Convert the grammar

$$S \rightarrow AB, A \rightarrow BS \mid b, B \rightarrow SA \mid a$$

into GNF.

(b) Design a push down automata for :

$$L = \{W\, c\, W^R \mid W \in (a, b)^+\}$$

(c) Consider the grammar given below :

$$S \rightarrow A1B, A \rightarrow 0A \mid \varepsilon, B \rightarrow 0B \mid 1B \mid \varepsilon$$

Give the Leftmost and Rightmost derivation for the string 1001.

6. (a) Write short notes on any two of the following :

(i) Universal TM

(ii) Halting problem

(iii) Church's thesis

(b) Design a TM for the following language :

$$L = \{a^n b^n c^n \mid n \geq 1\}$$

(c) Define decidable, undecidable and post correspondence problems in automata.

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