No. of Printed Pages : 05

Following Paper ID and Roll No. to be filled in your Answer Book.

PAPER ID : 33223 Roll No. | 1 | 2 | 2 | 0 | | | |

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.

[P. T. O.

(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?
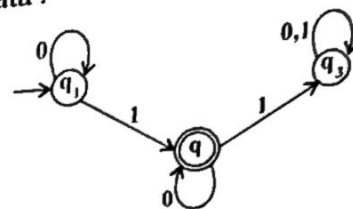
(h) What do you understand by Halting problem?

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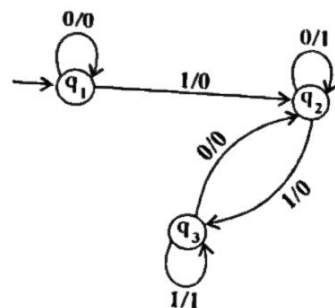
(c) State and prove the closure properties of context free language.

5. (a) Convert the grammar

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

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 :

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

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.

⌘⌘⌘