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Roll No. :

C022513(022)

B. Tech. (Fifth Semester) Examination,

Nov.-Dec. 2021

AICTE

(New Scheme)

(Computer Science & Engineering Branch)

FORMAL LANGUAGE and AUTOMATA THEORY

(BT3022)

Time Allowed : Three hours

Maximum Marks : 100

Minimum Pass Marks : 35

*Note : Attempt all questions. Part (a) is compulsory
& solve any two from (b), (c) & (d) of each
questions.*

Unit-I

1. (a) Prove that for any transition function δ and for any two input string x & y ,

4

$$\delta(q, xy) = \delta(\delta(q, x), y)$$

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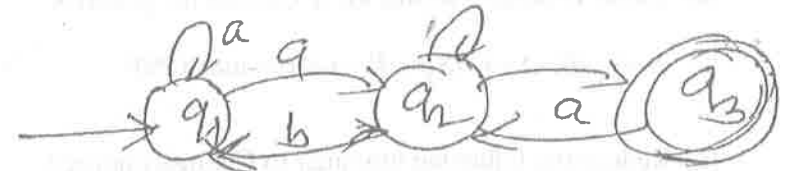
PTO

- (b) Construct a DFA accepting all strings w over $\{0, 1\}$, such that number of 1's in w is 3 mod 4. 8
- (c) Construct Transition System which can accept strings over the alphabet a, b, \dots containing either cat or rat. 8
- (d) Construct Mealy M/c which is equivalent to the Moore machine defined by table given. 8

	Next state		Output
	$a = 0$	$a = 1$	
$\rightarrow q_0$	q_1	q_2	1
q_1	q_3	q_2	0
q_2	q_2	q_1	1
q_3	q_0	q_3	1

Unit-II

2. (a) Write and explain Arden's Theorem for Regular expression. 4
- (b) Consider the following transition system identify the string recognised. 8



- (c) What is pumping Lemma? Write its application. Show that $L = \{a^{2^n} \mid n \geq 1\}$ is regular. 8
- (d) Construct a transition system corresponding to the regular expression. 8
- (i) $(ab + c^*)^* b$
- (ii) $a + bb + bab^* a$

Unit-III

3. (a) Find a grammar generating $L = \{a^n b^n c^i \mid n \geq 1, i \geq 0\}$. Define grammar. 4
- (b) Construct a grammar G generating $\{xx \mid x \in \{a, b\}^*\}$. Give Chomsky hierarchy of grammar. 8

[4]

(c) Define Greibach Normal form. Convert the grammar

$S \rightarrow AB, A \rightarrow BS|b, B \rightarrow SA|a$ into GNF. 8

(d) Reduce the following grammar to Chomsky normal form : 8

(i) $G = (\{S\}, \{a, b, c\}, \{S \rightarrow a|b|c.SS\}, S)$

(ii) $S \rightarrow abSb|a|aAb, A \rightarrow bS|aAAb$

Unit-IV

4. (a) Construct a pda A accepting the set of all string over $\{a, b\}$ with equal number of a 'S and b 'S. 4

(b) Define Turing Machine Model. Explain representation using Turing Machine. 8

(c) Write short notes on : 8

(i) Halting problem of Turing machine

(ii) Acceptance of push down Automata

(d) Design a TM that accept 8

$\{0^n 1^n \mid n \geq 1\}$

[5]

Unit-V

5. (a) What is post correspondence problem. Prove that the PCP with $\{(01, 011), (1, 10), (1, 11)\}$ has no solution. 4

(b) Show that : 8

(i) $f(x, y) = x^y$ is primitive recursive

(ii) $f_2(x, y) = x * y$ is primitive recursive

(c) Compute $A(1, 1); A(2, 1); A(1, 2); A(2, 2)$ using Ackersmann's function. 8

(d) Write short notes on : 8

(i) Turing model for computation

(ii) Construct TM that can compute the zero function Z .