Total number of printed pages: **Programme(UG)/5th Semester/UCSE503**

2022

FORMAL LANGUAGE AND AUTOMATA THEORY

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

Central Institute of Technology Kokrajhar

Q1.

a) Construct DFA for the following where the $\sum = \{x, y\}$:

i) All strings end with x followed by y.

ii) All strings where there are three y.

iii) All strings where the number of x and y are even respectively.

iv) All strings where the number of x is odd but the number of y is even.

b) Show that a language L where $L = x^n$ and $n > 3$ is regular.

((3+3+4) + 6)

Q2.

a) Consider the following state transition table of a DFA and minimize it (if possible). In the following DFA q0 is the initial state and both q3 and q5 are final state.

	Input = a	Input = b
q0	q1	q3
q1	q0	q3
q2	q1	q4
q3	q5	q5
q4	q5	q5
q5	q3	q3

b) Design a right and left linear grammar for the language L, where $L=a^m b^n$ and $m > 2$ and $n > 3$.

(10+10)

Q3. Consider the following languages and prove whether they are regular or not

i)L= $a^m b^n c^p$, where $p= m+n$.

ii)L = $a^m b^n c^p$ where $m>n>p$.

iii)L = a^m where m is always a prime number.

iv) L = a^m where m is always an even number.

(5+5+5+5)

Q4.

a) Consider the following grammar and convert it into i) Chomsky Normal form and ii) Greibach Normal Form –

$S \rightarrow aababA|a$

$A \rightarrow ABC| a$

$B \rightarrow BC|b$

$C \rightarrow y$

b) Consider the language L = $a^n b^{3n} c^{2n}$, $n>0$. Do you think the language L is context-free? Justify.

((6+6) +8)

Q5. Design a context-free grammar for the language L = $a^{3n} b^{2n}$, $n>0$. Construct a PDA that can accept L. Trace your PDA for the input string w, where w=aaaaaaaaabbbbbb.

(3+12+5)

Q6. Construct a TM that can accept the language L = $a^{4n} b^n c^{3n}$, $n>0$. Clearly write your logic and trace with any string that belongs to L.

(10+5+5)

Q7. Write short notes on the followings –

a) Recursive vs. Recursive Enumerable

b) Halting problem of TM

c) DFA vs NFA

d) Mealy vs Moore Machine

(5*4)

Central Institute of Technology Kokrajhar