

Total No. of printed pages = 3

19/6th Sem/DCSE 613



2022

**FORMAL LANGUAGE AND AUTOMATA
THEORY**

Full Marks – 100

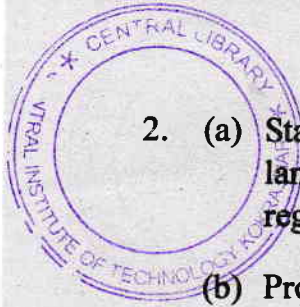
Time – Three hours

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

Answer any *five* questions.

1. (a) Construct a DFA for the language over $\{0, 1\}^*$ such that it contains "000" as a substring. 5
- (b) State the differences between NFA and DFA. 5
- (c) Give the regular expression for the set of all binary strings ending in 00. 5
- (d) Explain with an example conversion of NFA into DFA. 5

[Turn over



2. (a) State the pumping lemma for regular languages. Prove that $0^n 1^n$, $n \geq 1$ is not regular. 12

(b) Prove that complement of a regular language is also regular. 8

3. (a) Define regular and context free grammar. Give examples. 5

(b) Construct a Finite Automaton for the regular expression $(a+b)^*abb$. 5

(c) Find the language generated by the grammar :

$S \rightarrow AB$

$A \rightarrow A1 \mid 0$

$B \rightarrow 2B \mid 3$. 5

(d) Construct a Finite Automaton recognizing $L(G)$, where G is the grammar $S \rightarrow aS \mid bA \mid b$ and $A \rightarrow aA \mid bS \mid a$. 5

4. (a) Construct a CFG for set of strings that contain equal number of a's and b's over $\Sigma = \{a,b\}$. 5

(b) Construct the Context free grammar representing the set of palindromes over $(0+1)^*$. 5

(c) Let G be the grammar :

10

$S \rightarrow aB \mid bA$

$A \rightarrow a \mid aS \mid bAA$

$B \rightarrow b \mid bS \mid aBB.$

For the string aaabbabba,

Find :

(i) Left Most Derivation

(ii) Right Most Derivation.

Is the grammar ambiguous ?

5. Construct the CNF and GNF for the following grammar and explain the steps :

$S \rightarrow ABb \mid a, A \rightarrow aaA, B \rightarrow bAb.$ 20

6. Write short notes on the following : $10 \times 2 = 20$

(a) Chomsky Hierarchy

(b) Mealy and Moore machine.

