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^n1^n, $n>=1$ 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 –>AB

A –>A1 | 0

B –>2B | 3. 5

(d) Construct a Finite Automaton recognizing L(G), where G is the grammar S –> aS | bA | b and A –> aA | bS | 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 aaabbabbba,

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 –> ABb | a, A –> aaA, B –> bAb. 20

6. Write short notes on the following : 10×2=20

(a) Chomsky Hierarchy

(b) Mealy and Moore machine.