Spring Make Up Mid-Semester Examination- 2020
School of Computer Engineering
KIIT deemed to be University,
Bhubaneswar
Automata and Formal Languages(CS-2010)

Branch:CSE,IT,CSCE

Time : 1 hour 30 mins Full Marks: 20

(Answer any four questions including question number 1)

1.Specify the following statement True or False. Justify your answer. [1×5]

a) The following grammar represent the language of all strings over the alphabet a, b with equal number of a's followed by equal number of b's

$$S \rightarrow aSb \mid aabb$$

b) If a language is accepted by a NFA, then it is clearly context-free.

c) The following is an identity, where r, s are regular expressions, where r = s means L(r) = L(s)

$$(r + s)^* = r^* + s^*$$

d) The regular expression 0*(100 010 001)0* generates the language {w | w {0,1}* and w contains at least 2 0s and at most one 1}.

e) Given an NFA with N states, the corresponding DFA always have 2N states (assuming we explicitly include dead states).

2. Design an NFA for a regular expression r = (ab + ba)*(ab*)*bb. Convert that designed NFA to its equivalent DFA. [5]

3. Design DFA which will accept such strings whose binary equivalent of decimal number is divisible by 6(e.g 1100 will accept but 1101 not). Is that design is in minimized DFA? If not minimized that DFA. [5]

4. Write down CFG for the following languages on Σ = {a, b}. [5]

a) $L = \{a^p b^q \mid p \neq q\}$

b) $L = \{a^p b^q c^r \mid q = p + r\}$

c) $L = \{w \mid n_{a(w)} < n_{b(w)}\}$

d) L = {alternate sequence of a's and b's}

e) L = {string generated from expression r = (a + b)*aa(a + b)*}

5. Consider the following Context free grammar G: [5]

S →aAbB

A →aB|bB|λ

B →A|C|c

C →Cc

a)Write down Chomsky Normal Form of it.

b)Write down Greibach Normal Form of it.

All The Best