Annex. - Extra.

Automata and Formal Languages(CS-2010)

Spring Mid-Semester Examination- 2020
School of Computer Engineering
KIIT Deemed to be University,
Bhubaneswar-24

Time: 1 hour 30 mins | Full Marks: 20

(Answer any four questions including question number 1)

1. Answer the following questions briefly. [1×5]

a) Show that the language $L = \{a^n : n \geq 0, n \neq 4\}$ is regular.

b) Prove or disprove that the following pairs of regular expressions define the same language over the alphabet $\sum$={a, b}

$$(ab+ a)^*ab \text{ and } (aa^*b)^*.$$

c) Find an NFA with three states that accepts the language $L = \{a^n : n\geq1\} \cup \{b^m a^k : m\geq0, k\geq0\}$.

d) Construct an NFA equivalent to regular expression $r = (01 + 2^*)^* 1$.

e) Find the shortest string not in the language over $\sum$={a, b} of the regular expression $a^*b^*(ba)^*a^*$.

2. [2.5×2]

a) Design a DFA to accept all the strings w over $\sum$={1, 2, 3}such that the digits in w appear in non-decreasing order. For example, it accepts 1123, but not 1232.

b) Design a DFA for the following language on $\sum$={a, b}

$$L = \{w : n_a(w) + 2n_b(w) \bmod 3 < 2\}$$

3. [2.5×2]

a) Design an NFA that accepts strings over {0,1} that ends in 0 but doesn't have 11 as sub-string. Convert your NFA to DFA.

b) Find the minimum state DFA equivalent to the following DFA.
$M = (\{q_0, q_1, q_2, q_3, q_4, q_5\}, \sum=\{0, 1\}, \delta, q_0, F=\{q_3, q_5\})$

Q\∑	0	1
->q_0	q_1	q_3
q_1	q_0	q_3
q_2	q_1	q_4
*q_3	q_5	q_5
q_4	q_3	q_3
*q_5	q_5	q_5

P.T.O

[2+3]

4.

a) Draw the transition diagram for the following transition table. Find a regular expression equivalent to the DFA.

Q\Σ	0	1
->q_0	q_0	q_1
q_1	q_2	q_1
*q_2	q_0	q_2

b) Write regular expression for the following language:

i. $L = \{b^m a b^n \mid m > 0, n > 0\}$

ii. Any string of length multiple of 5 over $\{0,1,2\}$

iii. Any string where first symbol is 0 and third symbol from right is 0 over $\{0,1\}$

[2+3]

5.

a) If L_1 and L_2 are two regular languages then prove that $L_1 - L_2$ is also regular.

b) State Pumping Lemma for the regular languages. Show that the language $L=\{a^n b^{2n} \mid n>=1\}$ is not regular.

All The Best