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LCB2023040

Mid-Semester Examination September 2024

Theory of Computation (TOA3300C)

B.Tech. (CS/CSAI/CSB/IT)-3rd Sem

Regular and Back Paper, Date of Examination: 19/09/2024

QPS: Dr. Soumendu Chakraborty

Max Time: 2 Hour **Max Marks: 30**

Note: This question paper contains ***FOUR*** questions and ***ONE*** page. Attempt ***ALL*** questions. Answers to all the questions should be written in the same order as of the respective questions. Marks are indicated against each question. Assume the suitable data and mention in the answer sheet clearly, if found missing.

Q.1. a) Give the transition diagrams (State Diagram) of DFA recognizing the following language

$$L = \{w: n_b(w)\ mod\ 3 \geq n_a(w)\ mod\ 3\ and\ \Sigma = \{a, b\}\}$$

b) Show that the language L= $\{a^n$: n is either a multiple of three or a multiple of 5$\}$ is regular.

[5+4]

Q.2. Construct regular grammar for the following languages

a) $L = \{ab^5wb^2: w \in \{a, b\}^*\}$

b) $L = \{w: |w| mod\ 3 \geq 0\ and\ \Sigma = \{a, b\}\}$ **[3+3]**

Q.3. Construct a Mealy machine which is equivalent to the Moore machine defined by the following Table

Present state	Next state		Output
	a = 0	a = 1	
$\rightarrow q_0$	q_1	q_2	1
q_1	q_3	q_2	0
q_2	q_2	q_1	1
q_3	q_0	q_3	1

[4]

Q.4. a) State and prove pumping lemma for regular languages. Clearly develop the proof idea.

b) Show that the following language is not regular

$$B = \{(ab)^i a^j \mid i > j,\ j \geq 0\}$$ **[7+4]**