National Institute of Technology, Silchar

Subject Code : CS-204, Subject: Theory of Computation
Semester: 4th . Branch: Computer Sci. & Engg.
Duration: One Hour. Total Marks: 20

Figure in the right hand margin indicates full marks for the question.
All questions are compulsory (NO-NEGATIVE Marks for wrong Answers)

NOTE:
Fill google-form and submit your response along with your name, institute email ID and scholar No. in the classwork section at Google Classroom.

Q1. Let α be a string over some alphabet ∑. By odd(α), we refer to the string obtained by deleting symbols at all even positions of α. That is, if $\alpha = a_1 a_2 a_3 \ldots a_n$, then $odd(\alpha) = a_1 a_3 a_5 \ldots a_{n'}$, where n' is n or n-1 according as whether n is odd or even. For a language L in ∑* define odd(L) = {odd(α) : α ∈ L} then: **4**

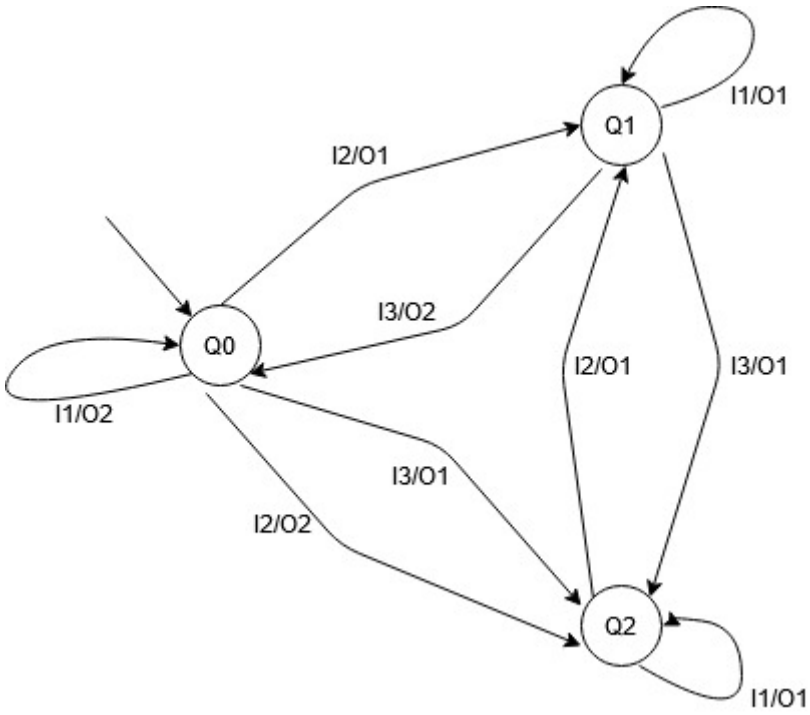
a) if L is regular, then odd(L) is finite and regular.

b) if L is regular, then odd(L) is not necessarily regular.

c) if L is regular, then odd(L) is in-finite and not regular.

d) if L is regular, then odd(L) is in-finite and regular.

Q2. **4**



The above transducer is designed for testing divisibility-by-3 for multi-digit decimal numbers with three different classes of inputs: I1 = (0,3,6,9), I2 = (1,4,7) , I3 = (2,5,8) and two different classes of outputs: O1 = 0 and O2 = 1.

What can you say about the states Q0, Q1 and Q2.

a) They represent start-state, carry and no-carry respectively.

b) They represent divisibility by 3, 6 and 9 respectively.

c) They represent zero-remainder state, one-remainder state and two-remainder state respectively.

d) They represent input class I1, I2 and I3 respectively.

Q3. Let $L \subseteq \sum^*$, where $\sum = \{a,b\}$, which of the following is true? **4**

a) $L = \{ x : x$ has an equal number of a's and b's $\}$ is regular.

b) $L = \{ a^n b^n : n \geq 1 \}$ is regular.

c) $L = \{ x:$ x has more number of a's than b's $\}$ is regular.

d) $L = \{ a^m b^n : n, m \geq 1 \}$ is regular.

Q4. Which of the following statement is wrong? **4**

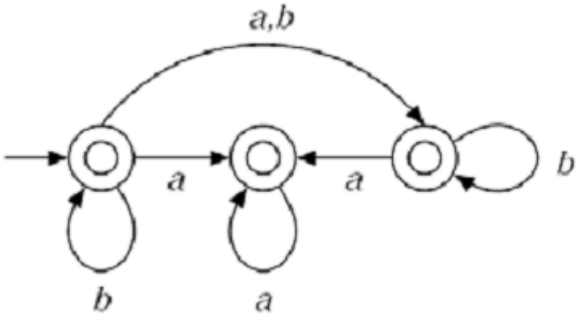
a) Any regular language has an equivalent context-free grammar.

b) Some non-regular language can't be generated by any context-free grammar.

c) The intersection of context-free languages and a regular language is always context-free.

d) All languages can be generated by context-free grammar.

Q5. Consider the following NFA (over the alphabet {a,b}). Let L denote the set of all strings not accepted by this NFA. **4**



The regular expression for L is :

a) ab (a+b)*

b) (a+b) b* ab

c) aab(a+b)*

d) b*ab*aa*b (a+b)*

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