Pharos University in Alexandria
Faculty of Computer Science & Artificial Intelligence
Department: Computer Science
Course Title and Code: Theory of Computation (CS307)
Formative Exam: Week 4 **Date:** 22 / 10 /2024 **Level: 3**
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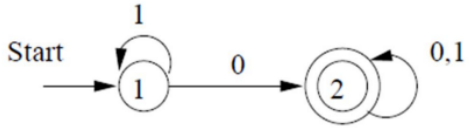
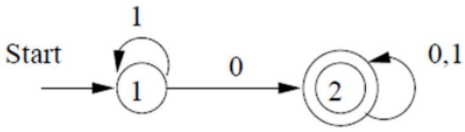
1. State each of the following sentences either it is right or wrong with correcting wrong ones.
   a. If r1, r2, r3 are RE, then r1+ (r2+r3) = (r1+r2) +r3.
   b. Every DFA is a NFA.
   c. The regular expression R=aaaaa represents the language L={∈,a,aa,aaa,aaaa,…..} which is a set of all combinations of possible input {a}.

2. Choose all the correct answer.
   i. Which of the following expressions describes the language that starting and ending with a and having any combination of b's in between.
      A. R = a b a
      B. R = a* b* a*
      C. R = a b* a
      D. R = a* b a*

   ii. The regular expression of the shown state diagram is
      A. R = 1 * 0 0 + 1 *
      B. R = 1 * 0 (0 + 1) *
      C. R = 1 * 0 0 1 *
      D. R = 1 * 0 * 1 *



   iii. Which of the following sentences describes the shown DFA correctly.
      A. It accepts only strings that include "10".
      B. It rejects string "0".
      C. It accepts string "10001".
      D. It rejects string "000".



3. Given that L1 is a language that accepts all strings that ends with "11" over inputs of {0,1}. Answer the following questions:
   a. Design a DFA machine of L1.
   b. Design a NFA machine of L1.
   c. Compare between the answers of a and b.
   d. Convert the NFA obtained in b to its equivalent DFA with steps.
   e. Compare between the answers of a and d.

4. Design a regular language that accepts at least two zeros in the given strings over inputs of {0,1}.