

# QUIZ 1

**Name:**

**Time:** Jan 28, 2016

**Instructions:** Please write down the correct answer for each question in the following box.

1	2	3	4	5	6	Total Score

1. Let  $L = \{010, 101, 001, 011\}$ , and  $K = \{w \mid 0w \in L\}$ . Which of the following strings is a member of  $K$ ?

- (A) 0101
- (B) 01
- (C) 011
- (D) 0110

2. Let  $\Sigma_1$  and  $\Sigma_2$  be two alphabets, with  $\Sigma_1 \neq \Sigma_2$ . Which of the following is necessarily true?

- (A)  $\Sigma_1^* = \Sigma_2^*$
- (B)  $\Sigma_1^n = \Sigma_2^n$  for all  $n$
- (C)  $|\Sigma_1^n| = |\Sigma_2^n|$ , for all  $n$ . Here  $|A|$  denotes the number of elements in the set  $A$ .
- (D)  $\Sigma_1^0 = \Sigma_2^0$

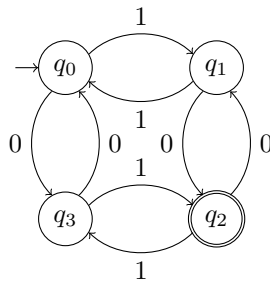


Figure 1: DFA  $M$  for questions 3 and 4

3. Consider the DFA  $M$  over the alphabet  $\{0, 1\}$  shown in Figure 1. Which of the following strings is accepted by  $M$ ?

- (A)  $\epsilon$
- (B) 0011
- (C) 1111000
- (D) 1011

4. The language recognized by DFA  $M$  in Figure 1 is

- (A)  $\{w \mid w \text{ has even length}\}$
- (B)  $\{w \mid w \text{ has an odd number of 1s and an odd number of 0s}\}$
- (C)  $\{w \mid w \text{ has an equal number of 0s and 1s}\}$
- (D)  $\{w \mid w \text{ has an odd number of 1s}\}.$

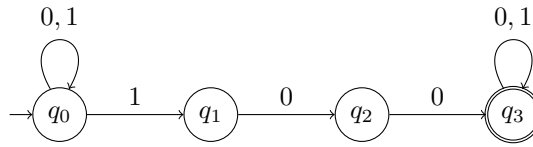


Figure 2: NFA  $N$  for problem 5

5. Consider the NFA  $N$  shown in Figure 2. Which of the following strings is *not* accepted by  $N$ ?
  - (A) 001
  - (B) 001100
  - (C) 10011001
  - (D) 1001
6. Let  $N = (Q, \Sigma, \delta, q_0, F)$  be an NFA. Recall that  $\hat{\Delta} : Q \times \Sigma^* \rightarrow 2^Q$  is a function that given a state  $q$  and string  $w$  returns the set of all states that  $N$  could be in after reading  $w$  from state  $q$ . Formally,  $\hat{\Delta}(q, w) = \{q' \mid q \xrightarrow{w}_N q'\}$ . We can say that  $N$  accepts a string  $w$  iff
  - (A)  $\hat{\Delta}(q_0, w) \in F$
  - (B)  $\hat{\Delta}(q_0, w) = F$
  - (C)  $\hat{\Delta}(q_0, w) \cap F \neq \emptyset$
  - (D)  $\hat{\Delta}(q_0, w) \subseteq F$