

CS341 Automata Theory
Discussion Session Worksheet 1

1. Write the regular expressions for the following languages:
- a. The language containing all strings that start with a and end with b . $? = \{a, b\}$.

 - b. The language containing all binary representations of even numbers with no leading 0s.

 - c. $\{w : w \in \{0, 1\}^* \wedge w \text{ has exactly a single } 1\}$ _____
 - d. $\{w : w \in \{0, 1\}^* \wedge w \text{ has at least a } 1\}$ _____
 - e. $\{w : w \in \{0, 1\}^* \wedge w \text{ has at most a single } 1\}$ _____
 - f. $\{w : w \in \{0, 1\}^* \wedge |w| \text{ is a multiple of } 3\}$ _____
 - g. $\{w : w \in \{a, b\}^* \wedge w \text{ starts and ends with the same symbol}\}$

-
2. $2\{\}$ =
- a. $\{\}$
 - b. $\{\{\}\}$
 - c. $\{\in\}$
 - d. $\{\{\}, \{\in\}\}$
 - e. none of a - d

3. $2\{\in\}$ =
- a. $\{\}$
 - b. $\{\{\}\}$
 - c. $\{\in\}$
 - d. $\{\{\}, \{\in\}\}$
 - e. none of a - d

4. $\{\}^*$ =
- a. $\{\}$
 - b. $\{\{\}\}$
 - c. $\{\in\}$
 - d. $\{\{\}, \{\in\}\}$
 - e. none of a - d

5. $\{\in\}^*$ =
- a. $\{\}$
 - b. $\{\{\}\}$
 - c. $\{\in\}$
 - d. $\{\{\}, \{\in\}\}$
 - e. none of a - d

6. The relation $R = \{(a, a), (a, c), (b, c), (c, b)\}$ over the set $A = \{a, b, c\}$ is

- a. reflexive
- b. antisymmetric
- c. symmetric
- d. transitive
- e. none of a – d

7. Which of the following sets is not equinumerous with the other four?
- a. the set of integer
 - b. the set of all ordered pairs of integers
 - c. the set of positive integers
 - d. the set of even integers
 - e. the set of all subsets of integers
8. What is the closure of even integers under subtraction?
-

CS341 Automata Theory
Discussion Session Worksheet 1 Answers

1. a) $a(a \cup b)^* b$
b) $1(1 \cup 0)^* 0 \cup 0$
c) $0^* 1 0^*$
d) $(0 \cup 1)^* 1 (0 \cup 1)^*$
e) $0^* (1 \cup \epsilon) 0^*$
f) $((0 \cup 1)(0 \cup 1)(0 \cup 1))^*$
g) $a(a \cup b)^* a \cup b(a \cup b)^* b \cup a \cup b$

2. b

3. d

4. c

5. c

6. e

7. e

8. even integers