MA0301 Elementary
discrete mathematics
Spring 2017

Exercise set 9

1 Homework Set 9

1 Find the number of distinct permutations of the sequence of letter:

a) T H O S E, b) U N U S U A L, c) S O C I O L O G I C A L ,

d) S A N N S Y N L I G H E T S T E T T H E T S F U N K S J O N E N E

2 Consider the two permutations:

$$a = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 3 & 6 & 4 & 5 & 1 & 2 \end{pmatrix} \qquad b = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 2 & 4 & 6 & 5 & 3 & 1 \end{pmatrix}$$

Calculate the permutations i) $a \circ b$, ii) $b \circ a$ and iii) find the inverses a^{-1} and b^{-1}.

3 Grimaldi's book (5. ed., Exercises 6.1, page 317): solve **Ex. 1**

Let $\Sigma = \{a, b, c, d, e\}$. (a) What is $|\Sigma^2|$? $|\Sigma^3|$? (b) How many strings in Σ^* have length at most 5?

4 Grimaldi's book (5. ed., Exercises 6.1, page 318): solve **Ex. 5**

Let $\Sigma = \{v, w, x, y, z\}$ and $A = \bigcup_{n=1}^{6} \Sigma^n$. How many strings in A have xy as a proper prefix?

5 Grimaldi's book (5. ed., Exercises 6.1, page 318): solve **Ex. 18**

Provide the proofs for the remaining parts of Theorems 1 and 2.

6 Grimaldi's book (5. ed., Exercises 6.2, page 324): solve **Ex. 3**

Let $M = (S, \mathcal{I}, \mathcal{O}, \nu, \omega)$ be a finite state machine where $S = \{s_0, s_1, s_2, s_3\}$, $\mathcal{I} = \{a, b, c\}$, $\mathcal{O} = \{0, 1\}$, and ν, ω are determined by the table below.

	ν			ω		
	a	b	c	a	b	c
s_0	s_0	s_3	s_2	0	1	1
s_1	s_1	s_1	s_3	0	0	1
s_2	s_1	s_1	s_3	1	1	0
s_3	s_2	s_3	s_0	1	0	1

a) Starting at s_0, what is the output for the input string *abbccc*?

b) Draw the state diagram for this finite state machine.

$\boxed{7}$ Grimaldi's book (5. ed., Exercises 6.3, page 332): solve **Ex. 8**

Determine a transfer sequence from state s_2 to state s_5 in finite state machine (c) of Exercise 7 (given by the table below). Is your sequence unique?

	ν		ω	
	0	1	0	1
s_0	s_1	s_2	0	1
s_1	s_0	s_2	1	1
s_2	s_2	s_3	1	1
s_3	s_6	s_4	0	0
s_4	s_5	s_5	1	0
s_5	s_3	s_4	1	0
s_6	s_6	s_6	0	0