

## Homework Assignment #7

### Note

This assignment is due 2:10PM Tuesday, May 10, 2016. Please write or type your answers on A4 (or similar size) paper. Drop your homework by the due time in Yih-Kuen Tsay's mail box on the first floor of Management College Building II. Late submission will be penalized by 20% for each working day overdue. You may discuss the problems with others, but copying answers is strictly forbidden.

### Problems

There are five problems in this assignment, each accounting for 20 points.

1. (6.16) Compute the *next* table as in the KMP algorithm for the string *ababbaabab*. Show the details of your calculation.
2. (6.47) Modify the KMP string matching algorithm to find the largest prefix of *B* that matches a substring of *A*. In other words, you do not need to match all of *B* inside *A*; instead, you want to find the largest match (but it has to start with  $b_1$ ).
3. (6.17) Given two strings  $A = bbaab$  and  $B = baaabb$ , compute the minimal cost matrix  $C[0..5, 0..6]$  for changing the first string character by character to the second one. Aside from giving the cost matrix, please show the details of how the entry  $C[5, 6]$  is computed.
4. (6.40) Design an algorithm that, given a set of integers  $S = \{x_1, x_2, \dots, x_n\}$ , finds a nonempty subset  $R \subseteq S$ , such that

$$\sum_{x_i \in R} x_i \equiv 0 \pmod{n}.$$

Before presenting your algorithm, please argue why such a nonempty subset must exist.

5. (6.62) You are asked to design a schedule for a round-robin tennis tournament. There are  $n = 2^k$  ( $k \geq 1$ ) players. Each player must play every other player, and each player must play one match per round for  $n - 1$  rounds. Denote the players by  $P_1, P_2, \dots, P_n$ . Output the schedule for each player. (Hint: use divide and conquer in the following way. First, divide the players into two equal groups and let them play within the groups for the first  $\frac{n}{2} - 1$  rounds. Then, design the games between the groups for the other  $\frac{n}{2}$  rounds.)