Homework Assignment #7

Note

This assignment is due 2:10PM Tuesday, May 9, 2017. 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 2. 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 *babbabbbb*. 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 $A = abaab$ and $B = bbaaab$, 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 $S = \{x_1, x_2, \ldots, x_n\}$, 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 paly one match per round for $n-1$ rounds. Denote the players by $P_1, P_2, \ldots, P_n$. 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.)