Discrete Math Final
2011/6/13
13:00-13:50 (50 minutes)

Student ID _____ Name _____

1. The following table shows in part the Huffman code for the seven symbols appearing in a text with the corresponding frequencies.

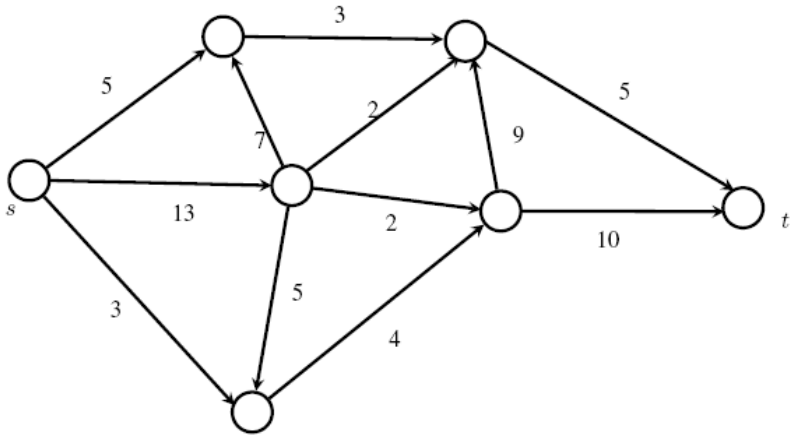
   A. Complete the table. Assign left child to the smaller frequency node. /* 아래 표를 완성하라. 허프만 트리 구성시 빈도가 낮은 노드를 왼쪽 자식 노드로 넣어라 */

Symbol	**Frequency**	**Simple code**	**Huffman code**
E	30	000	11
H	13	001	
L	10	011	
O	16	111	
F	5	110	
T	22	100	01
W	2	101	0000

   B. How many bits do you save for the string *WHEEELOFT* using the Huffman code as opposed to the Simple code? _____ How many bits do you save for the string *WHEWWF* by using the Huffman code? _____ [For these two questions, in case you end up with more bits using the Huffman code, use a negative value.] /* WHEEELOFT와 WHEWWF를 허프만 코드로 코딩함으로써 simple code를 사용한 경우에 비해 각각 몇 비트를 절약하는가? 만일 오히려 코드가 커졌다면 절약된 비트수는 음수로 표현하라 */

2. Find the number of terms in the expansion of each expression $(w + x + y + z)^{12}$. /* 주어진 표현을 전개하였을 때 나오는 항의 개수는 몇 개인가. */

3. What is the Max Flow from *s* to *t* in the following graph _____
/* 아래 그래프의 max flow는 얼마인가 */



4. Minimize Z = f(A,B,C) = $\overline{A}\,\overline{B}\,\overline{C}$+ $\overline{A}$B + AB$\overline{C}$ + AC, using Karnaugh map. /* 카르노맵을 써서 Z를 최소화하라. */

5. Construct a DFA that accepts the strings that contain the substring **101**.
   A. Use the directed graph representation of the DFA.
      /* 101을 포함하는 string만을 accept하는 DFA를 그려라 */

   B. Translate the DFA into a grammar that generates the same language that the DFA accepts. Let the initial symbol be σ. /* 위의 DFA가 accept하는 언어를 생성하는 문법을 기술하라. */

6. What is the number of *n*-bit strings that do not contain the substring **101** ? Give your answer in a recurrence relation. (You don't have to solve it, though) /* 101을 포함하지 않는 모든 n 비트 스트링의 개수를 recurrence relation으로 표현하라. */