Tutorial 9: **Student Name__________________ Student id:__________________**

Question 1: Let X=aabbacab and Y=baabcbb. Find the shortest common super-sequence for X and Y. (Backtracking process is required.)

Solution:

	Y j=0	b j=1	a j=2	a	b	c	b	b
X i=0	0	1	2	3	4	5	6	7
a i=1	1	←2	↖2	↖3	←4	←5	←6	←7
a i=2	2	←3	↖3	↖3	←4	←5	←6	←7
b	3	↖3	←4	↑4	↖4	←5	↖6	↖7
b	4	↖4	←5	↑5	↖5	←6	↖6	↖7
a	5	↑5	↖5	↖6	↑6	←7	↑7	←8
c	6	↑6	↑6	←7	↑7	↖7	←8	←9
a	7	↑7	↖7	↖7	←8	↑8	←9	←10
b	8	↖8	↑8	↑8	↖8	←9	↖9	↖10

Backtracking:

b→b→a→c→a→b→b→a→a→b

Ans: baabbacabb

Question 2:

Input: An array A[1..n] of n integers (positive or negative).

Task: Use dynamic method to find a non-empty interval [i, j] such that A[i]+A[i+1]+…+A[j] is maximized.

Example: Given an array: -1, 2 -3, 4, 5, -1

The sum of interval [1,1]=-1, [1,2]=-1+2=1, [3, 5]=-3+4+5=6.

Hint: Let d[i] be the cost of the max sum of intervals ending at position i.

That is, d[i]=max {sum[1,i], sum[2, i], …, sum[I,i]}.

Find recursive equation and use it to design a DP algorithm.

The final solution is the subinterval with the maximal d value.

In this example, d[1]=sum of [1,1]=-1, d[2]=sum of [2,2]=2.

d[3]=sum of [2,3]=-1, d[4]=sum of [4,4]=4.

Answer:

$$d(i) = \begin{cases} A[i] \quad if\ i = 1 \\ d[i-1] + A[i]\ if\ d[i-1] > 0 \\ A[i] \quad if\ d[i-1] \le 0 \end{cases}$$

Alg:

Phase 1

d(1):=A[i]

For i=2 to n do:

If d(i-1)>0,

d(i)=d(i-1)+A[i], B[i]=1,

/* containing A[i] and optimal interval ending at i-1.

Otherwise, d(i)=A[i], B[i]=0,

/* the optimal interval ending at i contains only A[i].

//* B for backtracking.

Phase 2: Find j with the maximal d value. (It can also be done in phase 1)

Phase 3: Backtracking:

i=j,

while(i>1 & B(i)=1)

j=j-1,

The optimal interval is [A[i],…, A[j]].