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Subject : Analysis of Algorithms (AOA)
Assignment-04

[AOA]

Assignment No-04

(Q.1) Find the Longest common subsequence (LCS) for given strings
$X = ABACABB$; $Y = BABCAB$.

Soln:-

We have use the following recursive formula to compute the length of an LCS of A_i & B_j : Hence $c(i,j)$ gives the length of LCS of sub-problem A_i & B_j.

$$c(i,j) = \begin{cases} 0 & \text{if } i=0 \text{ or } j=0 \\ c(i-1, j-1)+1 & \text{if } i,j>0 \text{ and } a_i = b_j \\ \max\{c(i, j-1), c(i-1, j)\} & \text{if } i,j>0 \text{ \& } a_i \neq b_j \end{cases}$$

- The given string $X = ABACABB$ and $Y = BABCAB$.

	J	0	1	2	3	4	5	6
i		Y_j	B	A	B	C	A	B
0	X_i	0	0	0	0	0	0	0
1	A	0	0↑	1↖	1	1	1↖	1
2	B	0	1↑	1*	2↖	2	2	2↖
3	A	0	1↑	1↑	2↑	2↑	3↖	2
4	C	0	1↑	↑1	2↑	3↖	3↑	3
5	A	0	1↑	1↑	2↑	3↑	4↖	4↖
6	B	0	1↖	2↑	2↖	3↑	4↖	↖5
7	B	0	1↖	2↖	3↖	3↑	4↑	5↖

$c(0,0) = c(1,0) = c(2,0) = c(3,0) = c(4,0) = c(5,0) = c(6,0) = c(7,0)$
$= 0$

- $c(1,1) = \max\{c(1,0), c(0,1)\} = \max(0,0) = 0$; $s(1,1) =$ "↑"

$c(2,1) = c(1,0) + 1 = 1$; $s(2,1) =$ "↖"

$c(3,1) = \max\{c(3,0), c(2,1)\} = \max(0,1) = 1$; $s(3,1) =$ "↑"

$c(4,1) = \max\{c(4,0), c(3,1)\} = \max(0,1) = 1$; $s(4,1) =$ "↑"

$c(5,1) = \max\{c(5,0), c(4,1)\} = \max(0,1) = 1$; $s(5,1) =$ "↑"

$c(6,1) = c(5,0) + 1 = 0 + 1 = 1$; $s(6,1) =$ "↖"

$c(7,1) = c(6,0) + 1 = 0 + 1 = 1$; $s(6,1) =$ "↖"

$c(1,2) = c(0,1) + 1 = 0 + 1 = 1$; $s(1,2) =$ "↖"

$c(1,3) = \max\{c(1,2), c(0,3)\} = \max(1,0) = 1$; $s(1,3) =$ " "

$c(1,4) = \max\{c(1,3), c(0,4)\} = \max(1,0) = 1$; $s(1,4) =$ " "

$c(1,5) = c(0,4) + 1 = 0 + 1 = 1$; $s(1,5) =$ "↖"

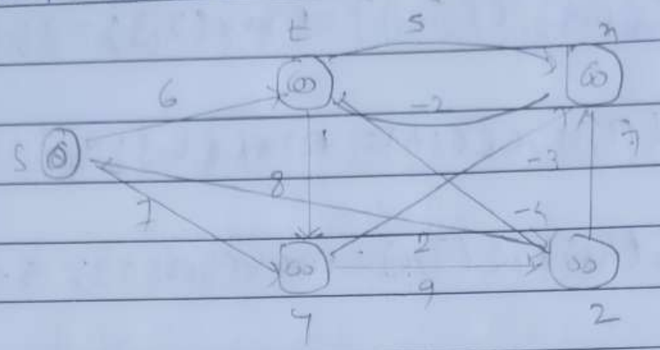
$c(1,6) = \max\{c(1,5), c(0,6)\} = \max(1,0) = 1$; $s(1,6) =$ " "

$c(2,2) = c(1,1) + 1 = 0 + 1 = 1$; $s(2,2) =$ "↖"

$c(3,2) = \max\{c(3,1), c(2,2)\} = \max(1,1) = 1$; $s(3,2) =$ "↑"

$c(4,2) = \max\{c(4,1), c(3,2)\} = \max(1,1) = 1$; $s(4,2) =$ "↑"

Q.2) Find the single source shortest path using Bellman ford algorithm for the given graph. Consider s as source vertex



→ (s,t), (s,y) (y,x) (y,z) (t,y), ~~(x,t)~~

(x, t) = -2 (t, z) = -4 ((z), x) = 7 (t, x) = 5 , (z, s) = 7

1st Iteration :

distance	S	T	x	y	z
path	0	6	∞	7	∞
		S		S	

2nd Iteration :-

distance	S	T	x	y	z
path	0	2	4	7	2
		x	4	S	t

3rd Iteration

	S	T	x	y	z
distance	0	6	4	7	2
path		3	y	S	T

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4th iteration

value of z is update until the 4 iteration complete find to ever node from so ax code Now we have do one more iteration to find where there exist edge upon on not

Hence shortest path is

(5,4) ; (4,x) ; (x,t) ; (t,2)

Q.3) Let n = 4

profit = {1,2,5,6}

weight : {2,3,4,5}

find the solution to 0/1 knapsack problem using Dynamic programming

→ Pi = 1 2 5 6

wi = 2 3 4 5

w →

	0	1	2	3	4	5	6	7	8
0	0	0	0	0	0	0	0	0	0
1	0	0	1	1	1	1	1	1	1
2	0	0	1	2	2	3	3	3	3
3	0	0	1	2	5	5	6	7	7
4	0	0	1	2	0	6	6	7	8

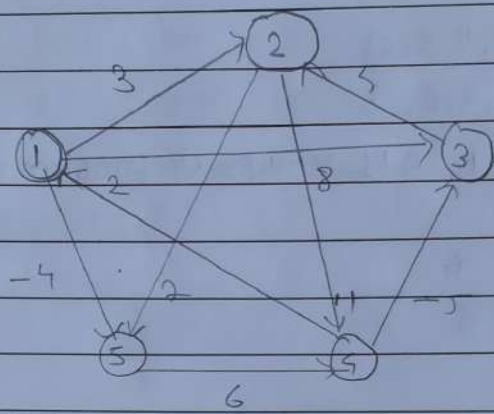
max (2+0, 1)	max (2+0, 1)	max (2+1; 1)
1 m 2 3 1	(2 - 1)	(3, 1)
= (2)	= 2	= 3

max (6+0,5)	max (6+0,c)	max (6+1,7)
c (6,5)	(6,6)	(7)
= c	= 6	

Hence te max Valle for given sol) 8

x_i (0, 0 . 1).

Q.4) Find th All Shortest path for following Graph.



D_0 =

	1	2	3	4	5
1	0	3	8	∞	-4
2	∞	0	∞	1	7
3	∞	4	6	∞	∞
4	2	∞	-5	0	∞
5	∞	∞	∞	6	0

π_0 =

	1	2	3	4	5
1	n	1	1	n	1
2	n	n	n	2	2
3	n	3	5	n	n
4	4	n	4	n	n
5	n	n	n	5	n

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D_1

	1	2	3	4	5
1	0	3	∞	∞	-4
2	∞	0	∞	1	7
3	∞	4	0	∞	∞
4	2	5	-5	0	-2
5	∞	∞	∞	6	0

$2,3 = \min(2,3 \quad 2-1 \quad 1 \to 4 \quad \infty, \infty+\infty)$

$(4,2) = \min \infty$

Π_1

	1	2	3	4	5
1	N	1	1	N	1
2	N	N	N	2	2
3	N	3	N	N	N
4	4	1	4	N	1
5	N	n	N	5	n

D_2

	1	2	3	4	5
1	0	3	∞	3	-4
2	∞	0	∞	1	7
3	∞	4	0	5	11
4	2	5	-5	0	-2
5	∞	∞	∞	6	0

Q5) Π_2

	1	2	3	4	5
1	n	1	1	2	1
2	n	n	n	2	2
3	n	3	n	2	2
4	4	1	4	n	1
5	n	n	n	5	n

D_3

	1	2	3	4	5
1	0	3	8	4	-4
2	∞	0	∞	1	7
3	∞	4	0	5	11
4	2	-1	-5	0	-2
5	∞	∞	∞	6	0

Π_3

	1	2	3	4	5
1	n	1	1	2	1
2	n	n	n	2	2
3	n	3	n	2	2
4	4	3	4	n	1
5	n	n	n	5	n

D_4

4(1,2,3,1)

	1	2	3	4	5
1	0	3	-1	4	-4
2	3	0	-4	1	-1
3	7	4	0	5	3
4	2	-1	-5	0	-2
5	8	5	1	6	0

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Π4

	1	2	3	4	5
1	n	1	4	2	1
2	4	n	n	2	2
3	4	3	n	2	2
4	4	3	n	7	1
5	4	n	n	5	n

D4

	1	2	3	4	5
1	0	3	-1	4	-4
2	3	0	-3	1	-1
3	7	4	0	5	3
4	2	-1	-5	0	-2
5	8	5	1	6	0

{1,2,3,4}

Π5

	1	2	3	4	5
1	n	1	4	2	1
2	4	n	4	2	1
3	4	3	n	2	1
4	4	3	4	n	1
5	4	3	4	5	n

D5

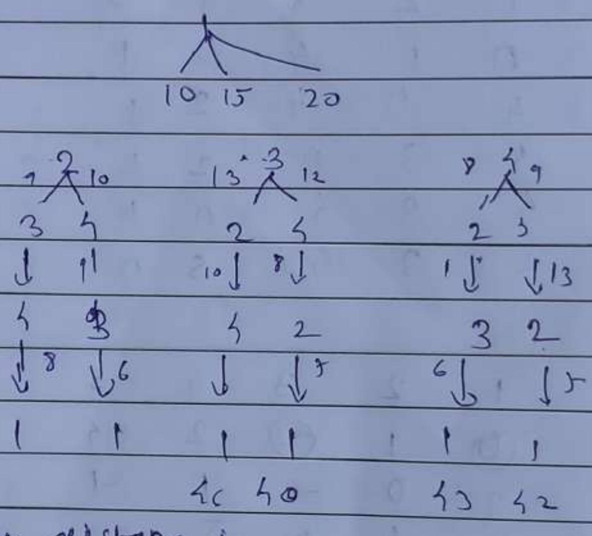
	1	2	3	4	5
1	0	1	-2	2	-4
2	3	0	-4	1	-1
3	7	4	0	5	3
4	2	-1	-5	0	-2
5	6	5	1	6	0

π_5

	1	2	3	4	5
1	M	3	4	5	1
2	4	1	4	2	1
3	4	3	3	2	1
4	4	3	4	n	1
5	4	3	4	5	M

(Q-5) Find the shortest distance using travelling salesman problem problem for the given graph consider source vertex is 1

	1	2	3	4
→ 1	0	10	15	20
2	5	0	9	10
3	6	13	0	12
4	8	8	9	0



Shortest distance is

$$(1) \xrightarrow{10} (2) \xrightarrow{10} (4) \xrightarrow{9} (3) \xrightarrow{6} (1)$$