Bellman-Ford(G, s, t)

n = no. of nodes in our graph G.

Array $M[0, 1, 2, \text{----} n-1, V]$

Define $M[0, t] = 0$ and $M[0, v] = \infty$ for all other $\boxed{v \in V}$

For $(i = 1, 2, 3 \text{---} n-1)$

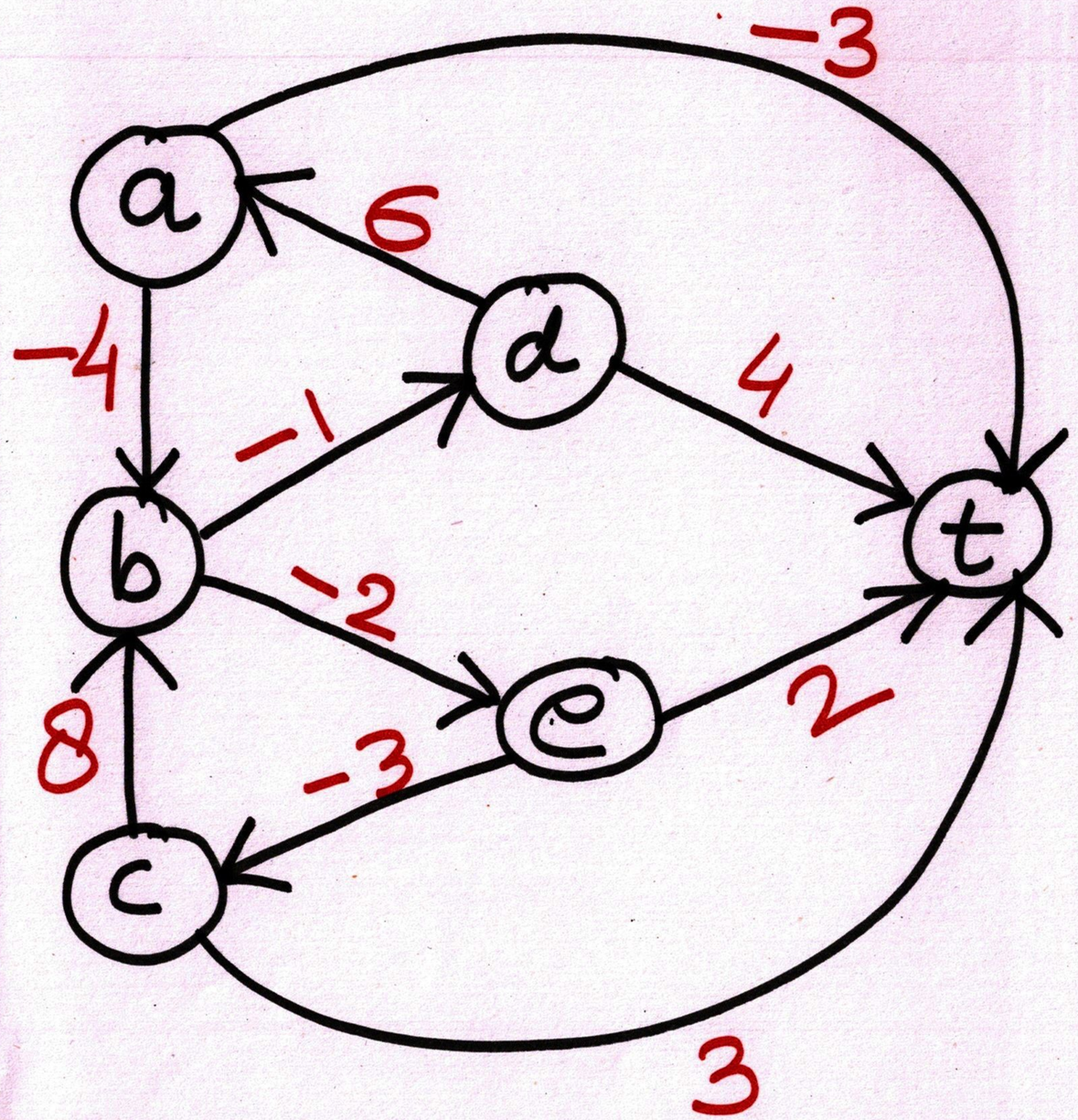
For $(v \in V)$ in any order

Compute $M[i, v]$ using the previous recurrence

End For

End For

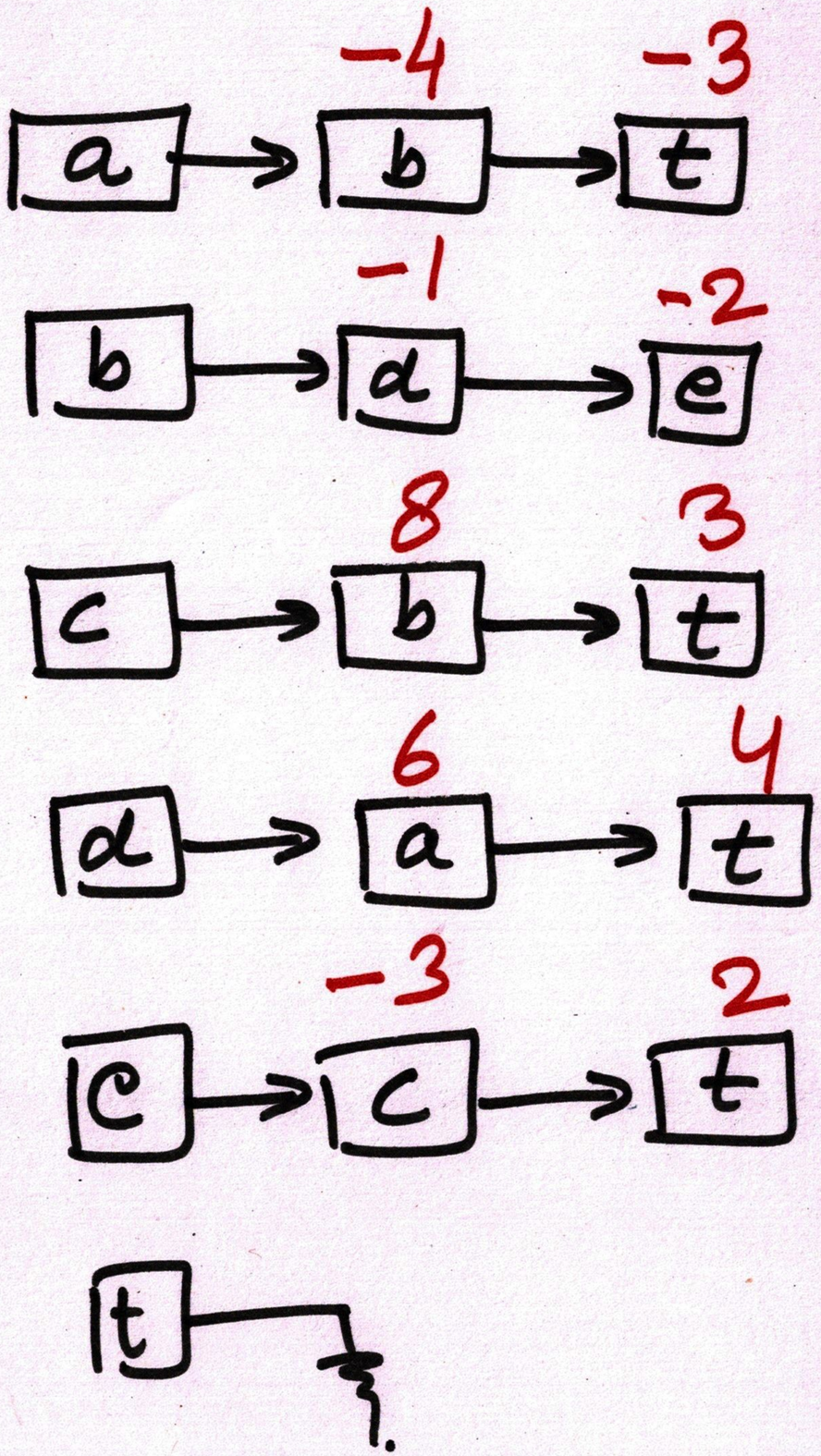
Return $M[n-1, s]$



	0	1	2	3	4	5
t						
a						
b						
c						
d						
e						

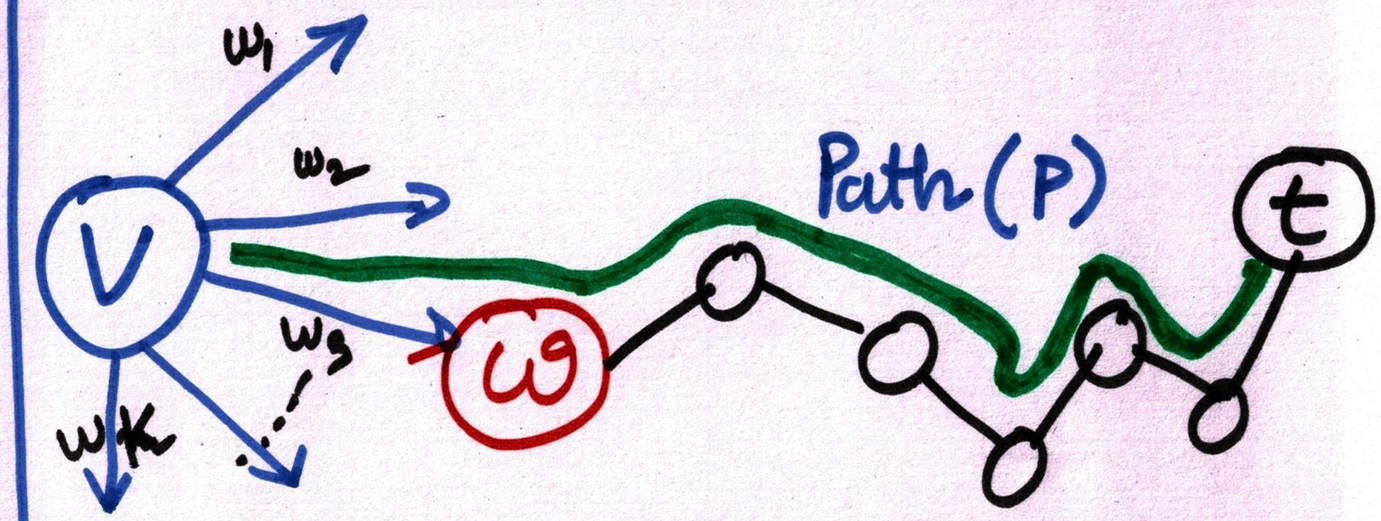
$$OPT(i, v) = MIN\left(\underbrace{OPT(i-1, v)}_{A}, \underbrace{\min_{w \in V}\left(OPT(i-1, w) + c_{vw}\right)}_{B}\right)$$

Adj. List :

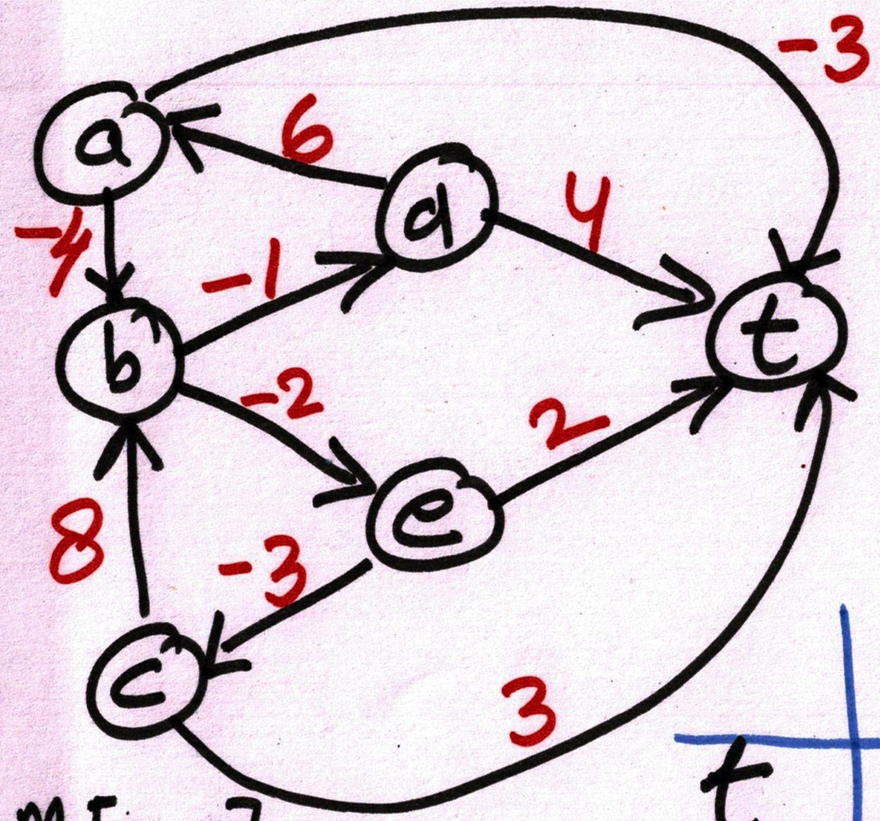


Basic Observation

$OPT(i, v) \Rightarrow$ Minimum cost of some path (P) from (V) to (t) using atmost (i) edges.



$$OPT(i, v) = \text{Min}\Big(\underbrace{OPT(i-1, v)}_{A},\ \underbrace{\min_{\substack{w \in V \\ (adj(v))}} \big(OPT(i-1, w) + c_{vw} \big)}_{B}\Big)$$



$$OPT(i, v) = \mathrm{Min}\left(OPT(i-1, v),\ \min_{w \in V}\left(OPT(i-1, w) + c_{vw}\right)\right)$$

$i=0$ $i=1$ $i=2$ $i=3$ $i=4$ $i=5$

	0	1	2	3	4	5
t	0	0	0	0	0	0
a	∞	-3	-3	-4	-6	-6
b	∞	∞	0	-2	-2	-2
c	∞	3	3	3	3	3
d	∞	4	3	3	2	0
e	∞	2	0	0	0	0

$M[1, a]$
$= \min(M(0, a),$
$\min \begin{cases} M(0, b) + c_{ab} \\ M(0, t) + c_{at} \end{cases}\}$
$= \min(\infty, \min(\infty, -3))$
$= -3$

$M[2, b] = 0$
$= (\infty)$
$M[1, b]$
$M[1, d] + c_{bd}$
$M[1, e] + c_{be}$

$4-1 = 3$

$2-2 = 0$

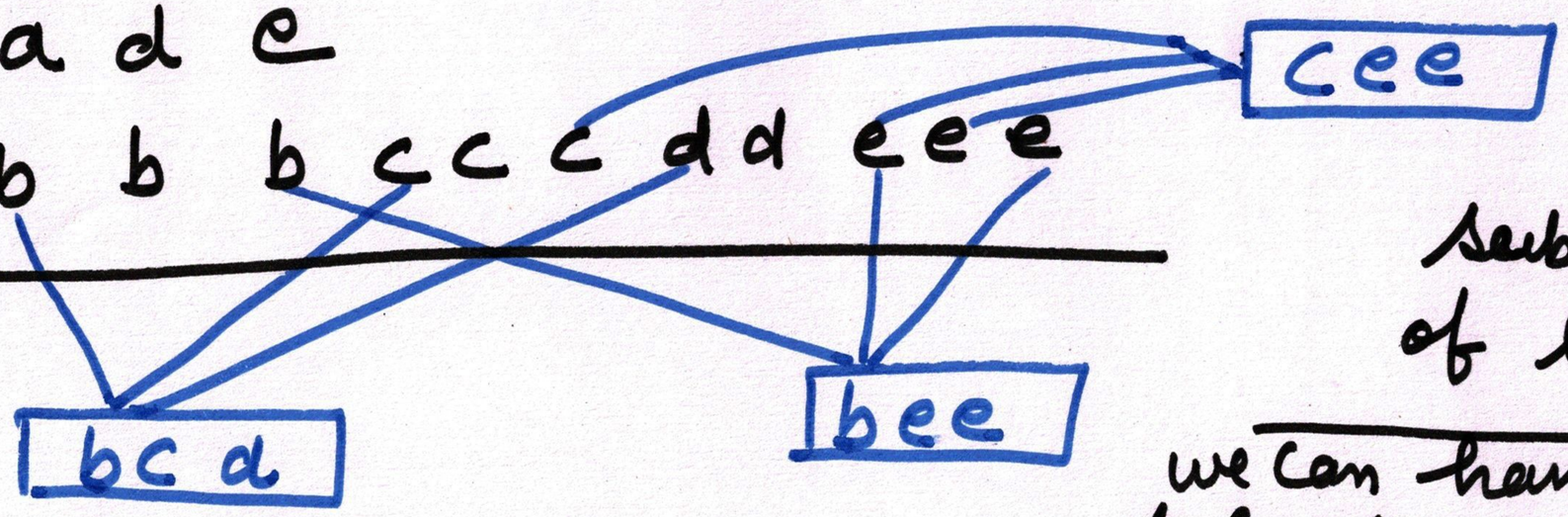
Longest Common Subsequence

(a) **Sequence**: Place where any symbol is coming is very important and it must have to be preserved.

2 sequences:

seq1: c a d e

seq2: a b b b c c c d d e e e



All of them are sub sequences of length 3.

we can have subsequences of length 1, 2, 3, --- (length of string)

What are Common subsequences:

a, ~~b~~, c, d, e ⇒ Common subseq. of length 1

cd, ce, ad, ae, de ⇒ Common subseq of length 2

cde, ade, ⇒ Common subseq of length 3

LCS(seq1, seq2) = 3 (with cde, ade)

$$X = \{x_1, x_2, x_3 \text{ - - - - - - } x_m\} \quad i = 1, 2, \text{- - -} m$$

$$Y = \{y_1, y_2, y_3, \text{ - - - - - } y_n\} \quad j = 1, 2, \text{- -} n.$$

$$L(X_i, Y_j) = 0 \quad \text{if } \underline{i = 0 \text{ or } j = 0}$$

increment

$$LCS(X_i, Y_j) = \begin{cases} LCS(X_{i-1}, Y_{j-1}) + 1 & \text{when } (X_i = Y_j) \,\&\, (i, j > 0) \\ \max\left(LCS(X_{i-1}, Y_j), LCS(X_i, Y_{j-1})\right) & \text{when } (X_i \neq Y_j) \,\&\, (i, j > 0) \end{cases}$$

(Matched)

NOT Matched (take previous max)