* Resource Allocation Graph Problem

(Appln of Multistage Graph problem)

- n units of resource are to be allocated to 'r' projects

Ex:

projects	Resources
P_1	R_1
P_2	R_2
P_3	R_3

- If 'j' units of resource (where $0 \leq j \leq n$) are allocated to project 'i' then the resulting net profit earned is $N(i, j)$

- The problem is to allocate the resource to 'n' projects in such a way as to maximize total net profit

- formulated as $n+1$ stages problem (n → no of prj)

- Stage 'i' rep. prj 'i'

- there are $n+1$ vertices with stage 'i' where $2 \leq i \leq n$ (3 → i = 2 & 3)

- Stages 1 & $n+1$ each have one vertex ⇒ $V(1,0) = s$ & $V(n+1, n) = t$ resp.

$V(3+1, 4) \Rightarrow V(4,4)$

- Edges of Graph are rep in form $\langle v(i,j), v(i+1,l) \rangle$ for all

$j \le l$ & $1 \le i \le r$

- for all such edges the edge cost or weight is shown as $w(i, l-j)$

(from 2nd last to last stage)

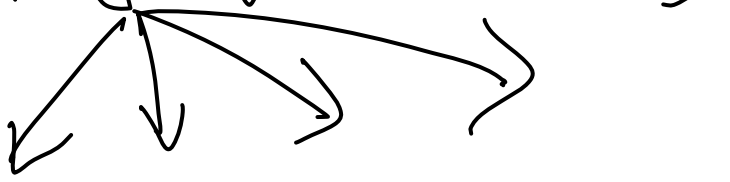
- edges in the last stage of graph are of type $\langle v(r,j), v(r+1,n) \rangle$

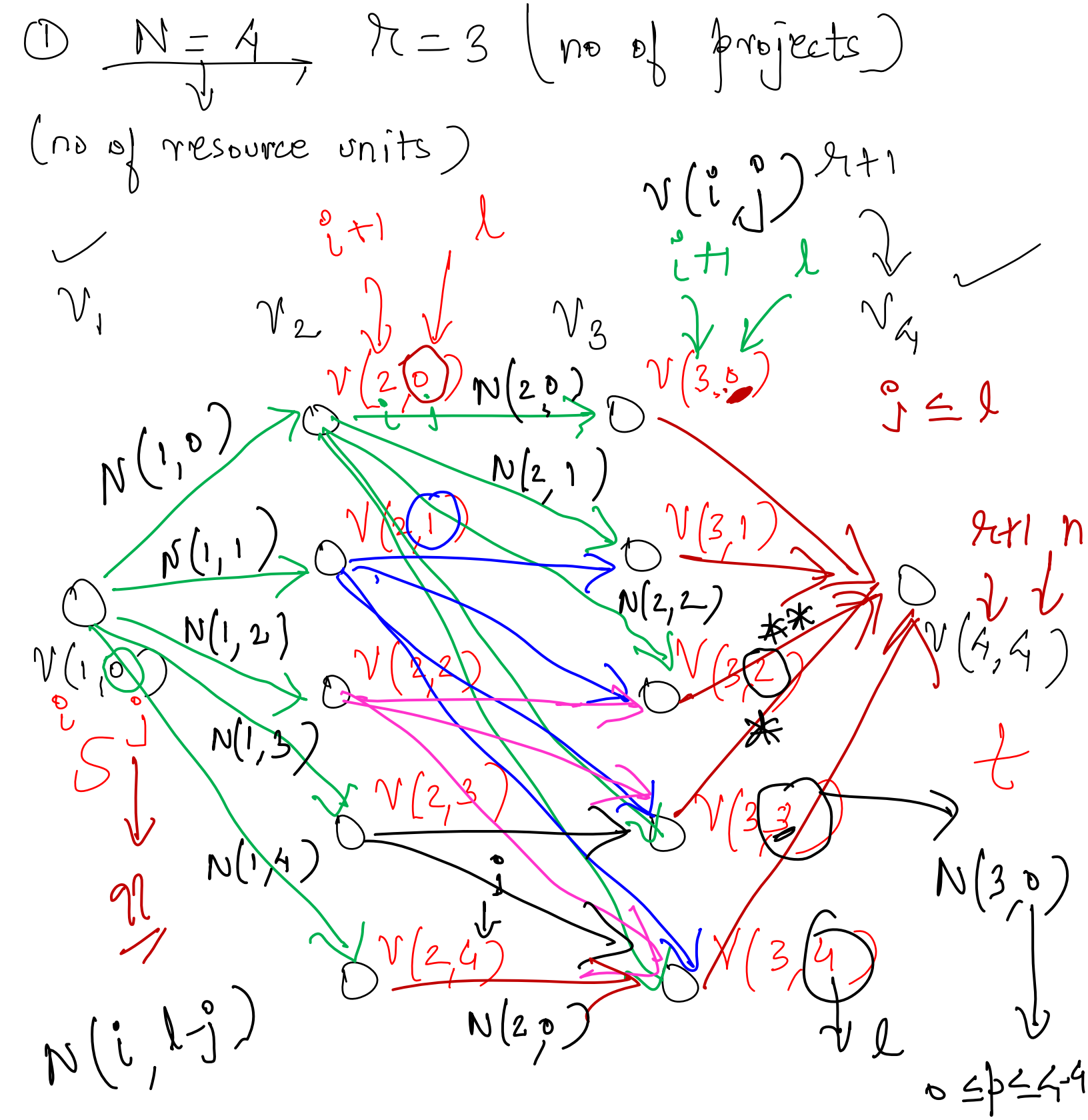
- Rep for the last stage edge cost/wt is given as

$$\max_{0 \le p \le n-j} \{ N(r, p) \}$$

Problem

$$\max_{0 \le p \le 4-j} \{ N(3, p) \}$$




① N = 4
r = 3 (no of projects)
(no of resource units)
V(i,j) r+1
i+1 l
V1 V2 V3 V4
V(2,0) N(2,0) V(3,0)
j ≤ l
N(1,0)
N(2,1)
N(1,1)
V(2,1) V(3,1)
r+1 n
N(2,2)
N(1,2)
V(1,0) V(2,2) V(3,2) V(4,4)
i j
N(1,3)
V(2,3) V(3,3)
t
N(3,0)
N(1,4)
q
V(2,4) V(3,4)
N(i, l-j)
N(2,0)
l
0 ≤ p ≤ 4-q

$0 \le p \le 0$

$* \Rightarrow$ here $j = 3$

$0 \le p \le 4 - 3$

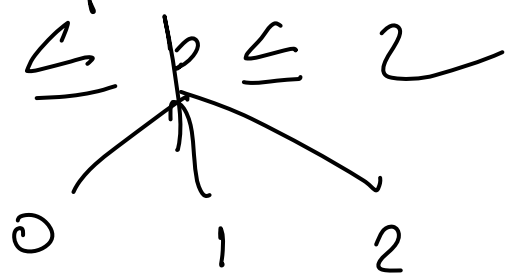
$0 \le p \le 1$

$* = \max \{ N(3,0), N(3,1) \}$

** edge cost

$j = 2 \Rightarrow 0 \le p \le 4 - 2$

$0 \le p \le 2$



~~**~~

$$= \max\{N(3,0), N(3,1), N($$