TEMA A

// x_i: Kg di composto $i \in \{A,B,C\}$ prodotti // y_j: # pacchi fornitore $j \in \{1,2\}$ acquistati (1)

// $z_i = 1$ se produco $i \in \{A,B,C\}$, 0 altrimenti // $\bar{x}_B$ (x'_B): Kg di B prodotti oltre (oltre) 3000

$x_A \geq 3000 \quad x_A \leq 5000 \quad y_1 \leq 200$

$$\max\ 25x_A + 20\bar{x}_B + 15x_C - (400y_1 + 500y_2) - 7000(z_A + z_B + z_C) + 18x'_B$$

$$0{,}2x_A + 0{,}1\bar{x}_B + 0{,}35x_C \leq 10y_1 + 28y_2$$
$$0{,}3x_A + 0{,}6\bar{x}_B + 0{,}45x_C \leq 20y_1 + 25y_2$$
$$0{,}5x_A + 0{,}3\bar{x}_B + 0{,}2x_C \leq 30y_1 + 8y_2$$
$$400y_1 + 500y_2 \leq 80\,000$$
$$x_A + \bar{x}_B + x_C \leq 15\,000$$

// $w = 1$ se produco almeno 50 Kg A+B

// $s = 1$ se produco ≥ 3000 Kg di B

$x_A \leq 15000 z_1$; $\bar{x}_B \leq 15000 z_B$; $x_C \leq 15000 z_C$ $\quad z_1 + z_B \leq 1$

$x_C \leq 15000 w \quad x_A + \bar{x}_B \geq 50 w$

$x_B = \bar{x}_B + x'_B \quad \bar{x}_B \leq 3000 \quad x'_B \leq Ms \quad \bar{x}_B \geq 3000 s$

$x_i \in \mathbb{R}_+ \quad y_j \in \mathbb{Z}_+ \quad \bar{x}_B, x'_B \in \mathbb{R}_+ \quad z_i \in \{0,1\} \quad w \in \{0,1\} \quad s \in \{0,1\} \quad \forall i \in \{A,B,C\}, j \in \{1,2\}$

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(2) $\min -3x_1 - x_2 - 4x_3 \quad (y_3 = -\hat{x}_3)$

s.t. $-x_1 + x_2 - \hat{x}_3 + x_4 = 1$

$2x_1 - x_2 + 2x_3 + x_5 = 2$

$x_1 - 2x_2 + x_6 = 1$

$x_1, x_2, \hat{x}_3, x_4, x_5, x_6 \geq 0$

	x_1	x_2	$\hat{x}_3$	x_4	x_5	x_6	z	$\bar{b}$	
	-3	-1	-4	0	0	0	-1	0	
x_4	-1	1	-1	1	0	0	0	1	
x_5	(2)	-1	2	0	1	0	0	2	
x_6	1	-2	0	0	0	1	0	1	
	0	-5/2	-1	0	3/2	0	-1	3	$+3R'_2$
x_4	0	(3/2)	0	1	1/2	0	0	2	$+R'_2$
x_1	1	-1/2	1	0	1/2	0	0	1	$/2$
x_6	0	-3/2	-1	0	-1/2	1	0	0	$-R'_2$
	0	0	-1	5	4	0	-1	13	$+5R_1$
x_2	0	1	0	2	1	0	0	4	$\times 2$
x_1	1	0	(1)	1	1	0	0	3	$+R_1$
x_6	0	0	-1	3	1	1	0	6	$+3R_1$
	1	0	0	6	5	0	-1	16	$+R_2$
x_2	0	1	0	2	1	0	0	4	$=$
x_3	1	0	1	1	1	0	0	3	$=$
x_6	1	0	0	4	2	1	0	9	$+R_2$

$x_1 = 0 \quad x_2 = 4 \quad x_3 = -3 \quad z^*_{max} = 16 = w^*$

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(3)

h	A	B	C	D	E	F	G	Acq
0	(0)	$+\infty$	$+\infty$	$+\infty$	$+\infty$	$+\infty$	$+\infty$	A
1	0	4A	(1A)	$+\infty$	$+\infty$	$+\infty$	$+\infty$	BC
2	0	(3C)	1A	5B	5B	3C	$+\infty$	BDEF
3	0	3C	1A	~~4~~ 2E	(4B)	3C	1F	DEG
4	0	3C	1A	(1E)	2G	3C	1F	DG
5	0	3C	1A	1E	2G	3C	1F	D
6	0	3C	0D	1E	2G	3C	1F	C
7	0	1C	0D	1E	2G	2C	1F	BF

CICLO NEGATIVO $B \leftarrow C \leftarrow D \leftarrow E \leftarrow G \leftarrow F \leftarrow C$

~~X~~ CAMMINO MINIMO DA A a D

CAMMINO MINIMO A→D ≤ 4 anche: $D \leftarrow E \leftarrow B \leftarrow G \leftarrow A$

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(4) ESAMINATO... ANDRISS. FORMULE... V

$\min 2u_1 + 3u_2 - u_4$

s.t. $2u_1 + u_2 + 2u_3 - u_4 \geq 5$

$-u_1 + u_3 + u_4 \leq 0$

$-2u_1 + 3u_2 + 4u_4 = 3$

u_1 lib $u_2 \leq 0$ $u_3 \geq 0$ $u_4 \leq 0$

$x_1 > 0 \Rightarrow 2u_1 + u_2 + 2u_3 - u_4 = 5$

$x_2 = 0 \Rightarrow$ //

x_3 lib $\Rightarrow$ A.D. !

SISTEMA

$2x_1 - x_2 - 2x_3 = 2$, (A.R.)

$x_1 + 3x_3 > 0 \Rightarrow u_2 = 0$

$2x_1 + x_2 < 3 \Rightarrow u_3 = 0$

$-x_1 + x_2 + 4x_3 = -1 \Rightarrow$ //

$\begin{cases} 2u_1 + u_2 + 2u_3 - u_4 = 5 & (\text{c.c.a.s.}) \\ -2u_1 + 3u_2 + 4u_4 = 3 & (\text{A.D.}) \\ u_2 = 0 & (\text{c.c.p.n.}) \\ u_3 = 0 & (\text{c.c.p.o.}) \end{cases}$

$\Rightarrow u_1 = 23/16, u_2 = 0, u_3 = 0, u_4 = 8/3$

$u_4 > 0 \Rightarrow$ UNICA SOL. DUALE DI È C.C.P.O. NON È AMMISSIBILE $\Rightarrow$ NON OTTIMA

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(5) a) BASE^N $[x_4, x_2, x_6]$; no ottima, 2 pivot non deg!

b) $x_4 < 0$

c) entra x_1, esce x_2 ; $x_4 = 0$

d) $x_1 x_2$; $x_1 x_4$; $x_3 x_8$; $x_3 x_4$; $x_5 x_4$

e) entra x_7, esce $x_6 \rightarrow x_4 x_2 x_7$ $(z = 30 + 0 \cdot 85/4)$

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(6) a) ~~13, 18~~ (13, 18)$_V$ ~~11 18~~$_V$ ~~10 16~~$_V$ (14, 20)$_V$

~~soluz~~ 13, 18 (o anche 14, 20)

b) $[15, 18]$

d) $P_3 P_4 P_7 P_6$, P_5 chiude

d) P_3

e) $LB_2 \geq 18$ (≤ 20) [opz. $\leq 16 \Rightarrow$ inf.]