**Problema**

**min z = - x2  
  
Soggetto a  
  
1) x1 + x2 >= 1   
2) x1 + x2 =< 2   
3) x1 - x2 =< 1   
4) - x1 + x2 =< 1   
        xi >= 0     per i = 1,...,2**

**Il problema espresso in FORMA STANDARD**

**min z = - x2  
  
Soggetto a  
  
1) x1 + x2 - x3 = 1   
2) x1 + x2 + x4 = 2   
3) x1 - x2 + x5 = 1   
4) - x1 + x2 + x6 = 1   
        xi >= 0     per i = 1,...,6**

**Il problema espresso in FORMA CANONICA**

**min z = - x2  
  
Soggetto a  
  
1) x1 + x2 - x3 + x7 = 1   
2) x1 + x2 + x4 = 2   
3) x1 - x2 + x5 = 1   
4) - x1 + x2 + x6 = 1   
        xi >= 0     per i = 1,...,7**

**Il problema espresso in FORMA CANONICA per la prima fase**

**min ρ = Σ αi = x7 = - x1 - x2 + x3 + 1   
  
Soggetto a  
  
1) x1 + x2 - x3 + x7 = 1   
2) x1 + x2 + x4 = 2   
3) x1 - x2 + x5 = 1   
4) - x1 + x2 + x6 = 1   
    xi >= 0   per i =1,...,7**

***Fase I***

**Tableau al passo 0:**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  | ***x1*** | ***x2*** | ***x3*** | ***x4*** | ***x5*** | ***x6*** | ***x7*** | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **r0** | -1 | -1 | -1 | 1 | 0 | 0 | 0 | 0 | | **r1** | 0 | 0 | -1 | 0 | 0 | 0 | 0 | 0 | | **r2** | 1 | 1 | 1 | -1 | 0 | 0 | 0 | 1 | | **r3** | 2 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | | **r4** | 1 | 1 | -1 | 0 | 0 | 1 | 0 | 0 | | **r5** | 1 | -1 | 1 | 0 | 0 | 0 | 1 | 0 | | Indici di base: S = { 7, 4, 5, 6 }  Soluzione di base: ρ = 1  x1 = 0  x2 = 0  x3 = 0  x4 = 2  x5 = 1  x6 = 1  x7 = 1 |

Soluzione non ammissibile. L'algoritmo continua ad iterare.  
Pivot in riga **r2** colonna **x1**.  
**Tableau al passo 1:**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  | ***x1*** | ***x2*** | ***x3*** | ***x4*** | ***x5*** | ***x6*** | ***x7*** | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **r0** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | | **r1** | 0 | 0 | -1 | 0 | 0 | 0 | 0 | 0 | | **r2** | 1 | 1 | 1 | -1 | 0 | 0 | 0 | 1 | | **r3** | 1 | 0 | 0 | 1 | 1 | 0 | 0 | -1 | | **r4** | 0 | 0 | -2 | 1 | 0 | 1 | 0 | -1 | | **r5** | 2 | 0 | 2 | -1 | 0 | 0 | 1 | 1 | | Indici di base: S = { 1, 4, 5, 6 }  Soluzione di base: ρ = 0  x1 = 1  x2 = 0  x3 = 0  x4 = 1  x5 = 0  x6 = 2  x7 = 0 |

ρ è minimizzata.  
Tutte le variabili artificiali sono fuori base

***Metodo del SIMPLESSO***

**Tableau al passo 0:**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  | ***x1*** | ***x2*** | ***x3*** | ***x4*** | ***x5*** | ***x6*** | | --- | --- | --- | --- | --- | --- | --- | --- | | **r0** | 0 | 0 | -1 | 0 | 0 | 0 | 0 | | **r1** | 1 | 1 | 1 | -1 | 0 | 0 | 0 | | **r2** | 1 | 0 | 0 | 1 | 1 | 0 | 0 | | **r3** | 0 | 0 | -2 | 1 | 0 | 1 | 0 | | **r4** | 2 | 0 | 2 | -1 | 0 | 0 | 1 | | Indici di base: S = { 1, 4, 5, 6 }  Soluzione di base: z = 0  x1 = 1  x2 = 0  x3 = 0  x4 = 1  x5 = 0  x6 = 2 |

Soluzione migliorabile. L'algoritmo continua ad iterare.  
Pivot in riga **r1** colonna **x2**.  
**Tableau al passo 1:**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  | ***x1*** | ***x2*** | ***x3*** | ***x4*** | ***x5*** | ***x6*** | | --- | --- | --- | --- | --- | --- | --- | --- | | **r0** | 1 | 1 | 0 | -1 | 0 | 0 | 0 | | **r1** | 1 | 1 | 1 | -1 | 0 | 0 | 0 | | **r2** | 1 | 0 | 0 | 1 | 1 | 0 | 0 | | **r3** | 2 | 2 | 0 | -1 | 0 | 1 | 0 | | **r4** | 0 | -2 | 0 | 1 | 0 | 0 | 1 | | Indici di base: S = { 2, 4, 5, 6 }  Soluzione di base: z = -1  x1 = 0  x2 = 1  x3 = 0  x4 = 1  x5 = 2  x6 = 0 |

Soluzione migliorabile. L'algoritmo continua ad iterare.  
Pivot in riga **r4** colonna **x3**.  
**Tableau al passo 2:**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  | ***x1*** | ***x2*** | ***x3*** | ***x4*** | ***x5*** | ***x6*** | | --- | --- | --- | --- | --- | --- | --- | --- | | **r0** | 1 | -1 | 0 | 0 | 0 | 0 | 1 | | **r1** | 1 | -1 | 1 | 0 | 0 | 0 | 1 | | **r2** | 1 | 2 | 0 | 0 | 1 | 0 | -1 | | **r3** | 2 | 0 | 0 | 0 | 0 | 1 | 1 | | **r4** | 0 | -2 | 0 | 1 | 0 | 0 | 1 | | Indici di base: S = { 2, 4, 5, 3 }  Soluzione di base: z = -1  x1 = 0  x2 = 1  x3 = 0  x4 = 1  x5 = 2  x6 = 0 |

Soluzione migliorabile. L'algoritmo continua ad iterare. Pivot in riga **r2** colonna **x1**.

**Tableau al passo 3:**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  | ***x1*** | ***x2*** | ***x3*** | ***x4*** | ***x5*** | ***x6*** | | --- | --- | --- | --- | --- | --- | --- | --- | | **r0** | 3/2 | 0 | 0 | 0 | 1/2 | 0 | 1/2 | | **r1** | 3/2 | 0 | 1 | 0 | 1/2 | 0 | 1/2 | | **r2** | 1/2 | 1 | 0 | 0 | 1/2 | 0 | -1/2 | | **r3** | 2 | 0 | 0 | 0 | 0 | 1 | 1 | | **r4** | 1 | 0 | 0 | 1 | 1 | 0 | 0 | | Indici di base: S = { 2, 1, 5, 3 }  Soluzione di base: z = -3/2  x1 = 1/2  x2 = 3/2  x3 = 1  x4 = 0  x5 = 2  x6 = 0 |

Soluzione **ottima**:     z\* = -3/2,     x\* = [ 1/2, 3/2, 1, 0, 2, 0 ]T

