4.8 LÍNEA TRIPLE SOBRE LAS MISMAS BARRAS EN SUS DOS EXTREMOS
(Memoria Descriptiva, pág. 5, Esquema 7)

4.8.1 Falta Triple

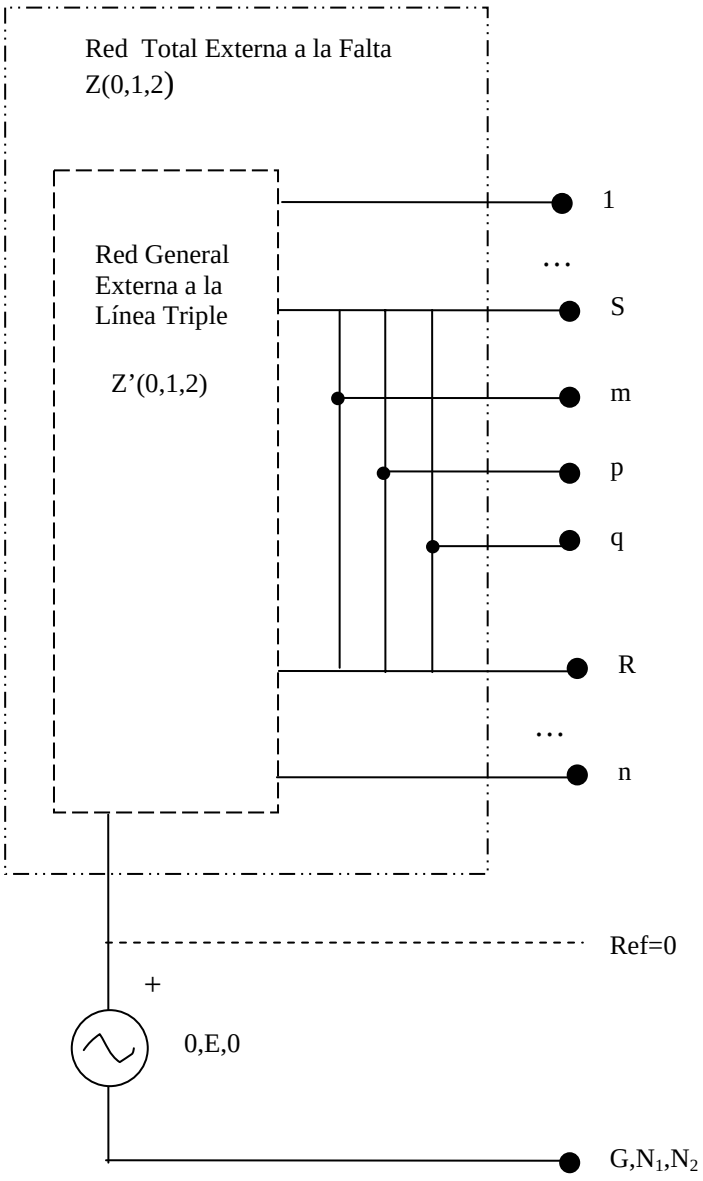


Fig. 4.8.1.a

En lo que sigue se desarrollan los fundamentos de los programas:

PC173
PG73ic
PG73ni
PG73iTf

La nomenclatura de estas denominaciones se explica en el Aptdo. 4.1 de esta Memoria.

Caso 1: Impedancia de Transferencia Finita

Sustituyendo la Red General Externa a la Línea Triple por su Equivalente Fuente-Transferencia :

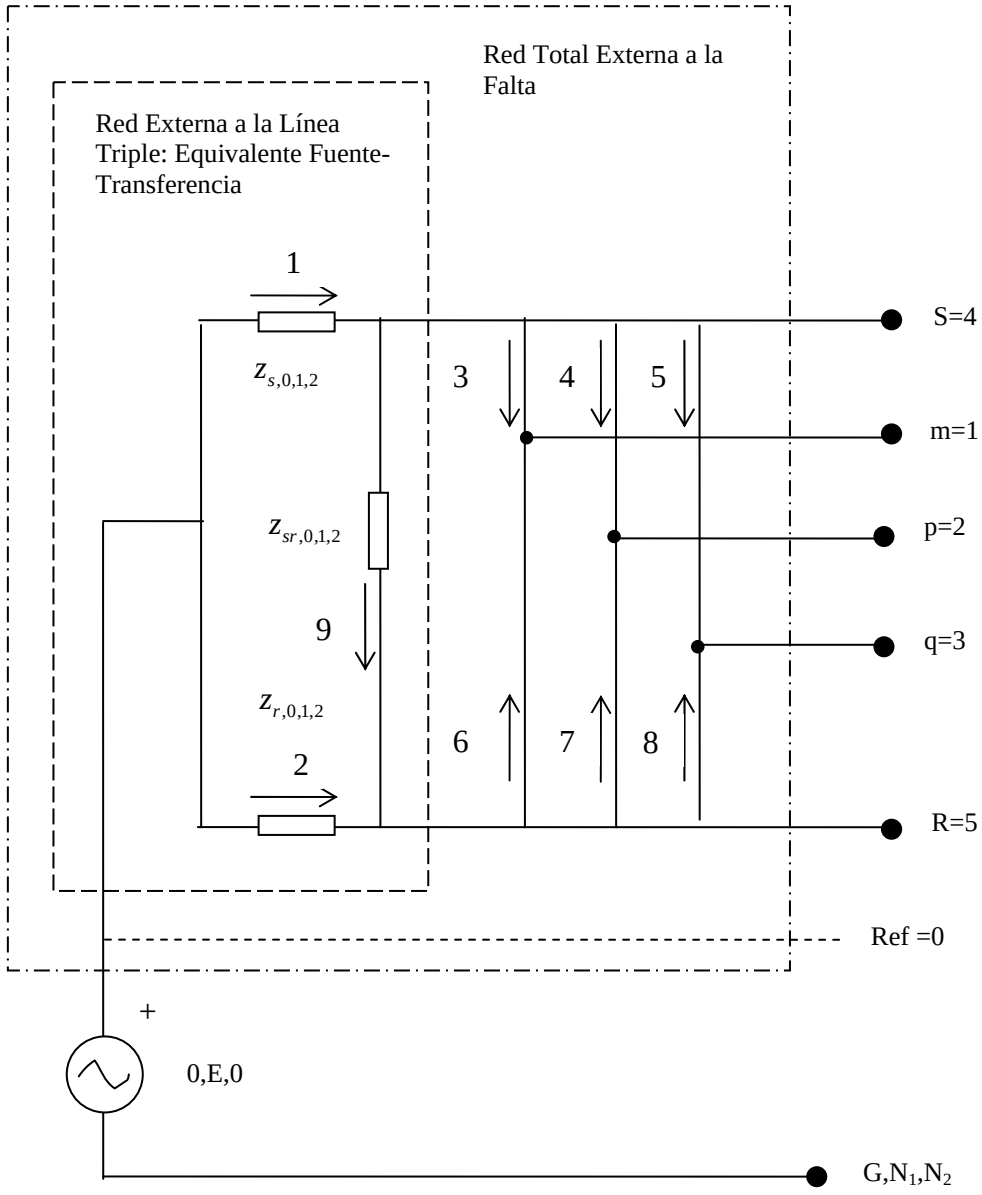


Fig. 4.8.1.b

Red Total Externa a la Falta (Secuencias 0,1,2):

- Numerar las Barras
  Barra 1= Punto de la Falta m
  Barra 2 = Punto de la Falta p
  Barra 3 = Punto de la Falta q
  Barra 4 = S
  Barra 5 = R

- Numerar y Orientar los Elementos:

Elemento 1 = Ref-4
Elemento 2 = Ref-5
Elemento 3 = 4-1
Elemento 4 = 4-2
Elemento 5 = 4-3
Elemento 6 = 5-1
Elemento 7 = 5-2
Elemento 8 = 5-3
Elemento 9 = 4-5

Matriz de Incidencia Elemento-Barra de la Red Total Externa a la Falta (Sec. 0,1,2)

$$M_{inc} = \begin{bmatrix} 0 & 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & 0 & -1 \\ -1 & 0 & 0 & 1 & 0 \\ 0 & -1 & 0 & 1 & 0 \\ 0 & 0 & -1 & 1 & 0 \\ -1 & 0 & 0 & 0 & 1 \\ 0 & -1 & 0 & 0 & 1 \\ 0 & 0 & -1 & 0 & 1 \\ 0 & 0 & 0 & 1 & -1 \end{bmatrix}$$

Secuencia 0:

Z_0 = Matriz de Impedancia de Barras, Secuencia 0, de la Red Total Externa a la Falta

Determinación de Z_0 :

Conocidos:
- z_{s0}, z_{sr0}, z_{r0}
- Datos de la Línea Triple a la Secuencia 0
- Posición de la Falta (m,p,q)

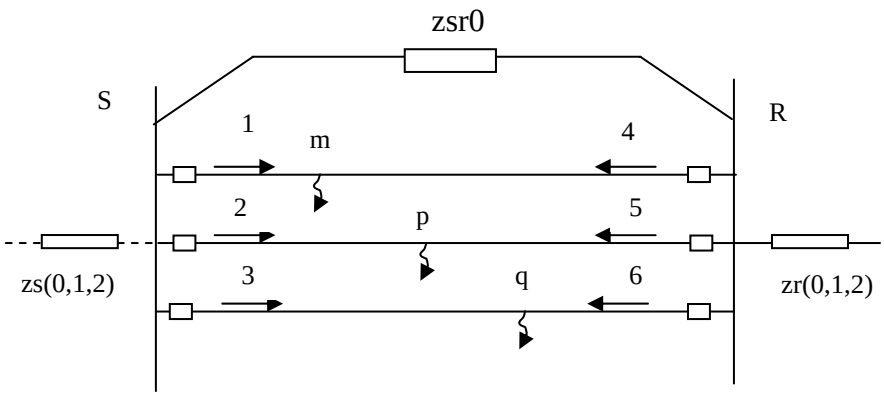
z_{e0} = Matriz Primitiva de Impedancia de la Red Total Externa a la Falta (Sec. 0)

Casos: posiciones relativas de m,p,q.
Se listan los Elementos no nulos de z_{e0} (9x9), para los diversos casos (Ver Fig. 4.8.1.b).

```
ze0(1,1)=zs0;
ze0(2,2)=zr0;
ze0(3,3)=zl0*m;
ze0(4,4)=zl0*p;
ze0(5,5)=zl0*q;
ze0(6,6)=zl0*(1-m);
ze0(7,7)=zl0*(1-p);
ze0(8,8)=zl0*(1-q);
ze0(9,9)=zsr0;
```

Se listan a continuación los elementos no diagonales de z_{e0} para las distintas combinaciones que se pueden establecer entre los valores relativos de m, p, q :

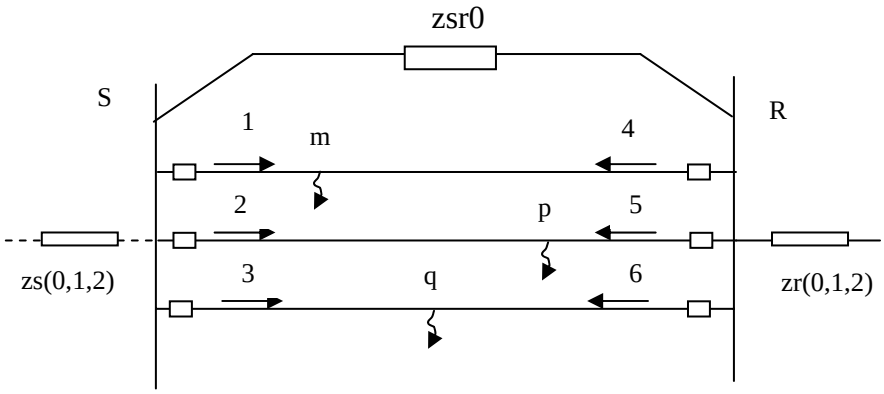
Si m<=p y p<=q



z_{e0}(3,4)=zlM0*m;
z_{e0}(3,5)=zlM0*m;
z_{e0}(4,5)=zlM0*p;
z_{e0}(4,6)=-zlM0*(p-m);
z_{e0}(5,6)=-zlM0*(q-m);
z_{e0}(5,7)=-zlM0*(q-p);
z_{e0}(6,7)=zlM0*(1-p);
z_{e0}(6,8)=zlM0*(1-q);
z_{e0}(7,8)=zlM0*(1-q);

z_{e0}(4,3)= z_{e0}(3,4);
z_{e0}(5,3)= z_{e0}(3,5);
z_{e0}(5,4)= z_{e0}(4,5);
z_{e0}(6,4)= z_{e0}(4,6);
z_{e0}(6,5)= z_{e0}(5,6);
z_{e0}(7,5)= z_{e0}(5,7);
z_{e0}(7,6)= z_{e0}(6,7);
z_{e0}(8,6)= z_{e0}(6,8);
z_{e0}(8,7)= z_{e0}(7,8);

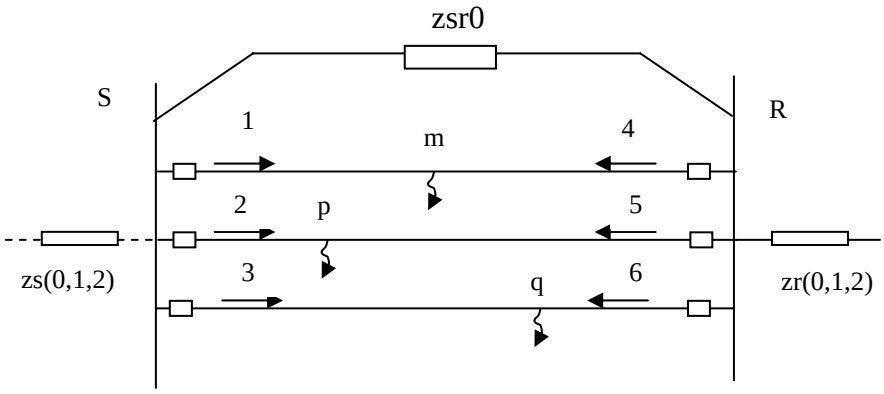
De otra forma, si m<=q y q<=p



z_{e0}(3,4)=zlM0*m;
z_{e0}(3,5)=zlM0*m;
z_{e0}(4,5)=zlM0*q;
z_{e0}(4,6)=-zlM0*(p-m);
z_{e0}(4,8)=-zlM0*(p-q);
z_{e0}(5,6)=-zlM0*(q-m);
z_{e0}(6,7)=zlM0*(1-p);
z_{e0}(6,8)=zlM0*(1-q);
z_{e0}(7,8)=zlM0*(1-p);

z_{e0}(4,3)= z_{e0}(3,4);
z_{e0}(5,3)= z_{e0}(3,5);
z_{e0}(5,4)= z_{e0}(4,5);
z_{e0}(6,4)= z_{e0}(4,6);
z_{e0}(8,4)= z_{e0}(4,8);
z_{e0}(6,5)= z_{e0}(5,6);
z_{e0}(7,6)= z_{e0}(6,7);
z_{e0}(8,6)= z_{e0}(6,8);
z_{e0}(8,7)= z_{e0}(7,8);

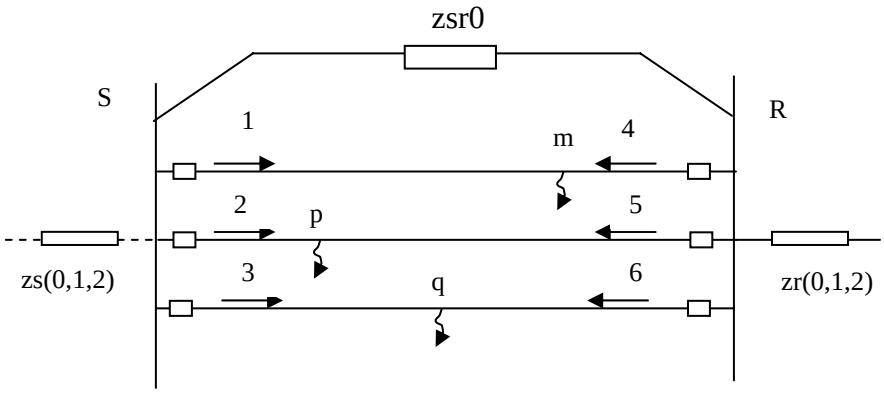
De otra forma,si p<=m y m<=q



z_{e0} (3,4)=zlM0*p;
z_{e0} (3,5)=zlM0*m;
z_{e0} (3,7)=-zlM0*(m-p);
z_{e0} (4,5)=zlM0*p;
z_{e0} (5,6)=-zlM0*(q-m);
z_{e0} (5,7)=-zlM0*(q-p);
z_{e0} (6,7)=zlM0*(1-m);
z_{e0} (6,8)=zlM0*(1-q);
z_{e0} (7,8)=zlM0*(1-q);

z_{e0}(4,3)= z_{e0}(3,4);
z_{e0}(5,3)= z_{e0}(3,5);
z_{e0}(7,3)= z_{e0}(3,7);
z_{e0}(5,4)= z_{e0}(4,5);
z_{e0}(6,5)= z_{e0}(5,6);
z_{e0}(7,5)= z_{e0}(5,7);
z_{e0}(7,6)= z_{e0}(6,7);
z_{e0}(8,6)= z_{e0}(6,8);
z_{e0}(8,7)= z_{e0}(7,8);

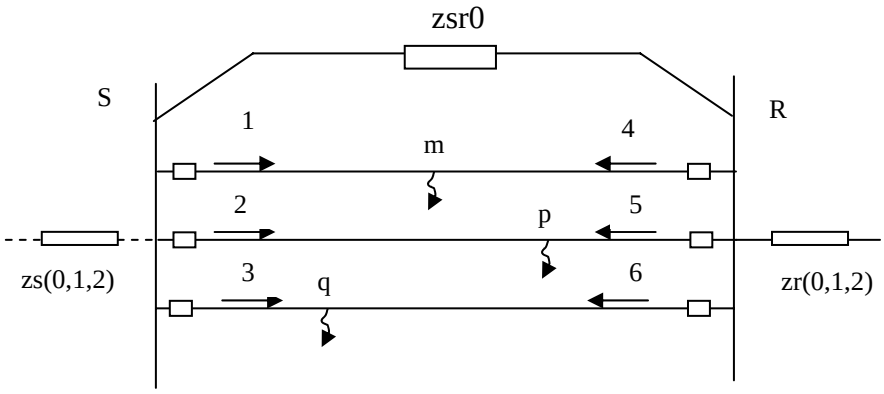
De otra forma,si p<=q y q<=m



z_{e0}(3,4)=zlM0*p;
z_{e0}(3,5)=zlM0*q;
z_{e0}(3,7)=-zlM0*(m-p);
z_{e0}(3,8)=-zlM0*(m-q);
z_{e0}(4,5)=zlM0*p;
z_{e0}(5,7)=-zlM0*(q-p);
z_{e0}(6,7)=zlM0*(1-m);
z_{e0}(6,8)=zlM0*(1-m);
z_{e0}(7,8)=zlM0*(1-q);

z_{e0}(4,3)= z_{e0}(3,4);
z_{e0}(5,3)= z_{e0}(3,5);
z_{e0}(7,3)= z_{e0}(3,7);
z_{e0}(8,3)= z_{e0}(3,8);
z_{e0}(5,4)= z_{e0}(4,5);
z_{e0}(7,5)= z_{e0}(5,7);
z_{e0}(7,6)= z_{e0}(6,7);
z_{e0}(8,6)= z_{e0}(6,8);
z_{e0}(8,7)= z_{e0}(7,8);

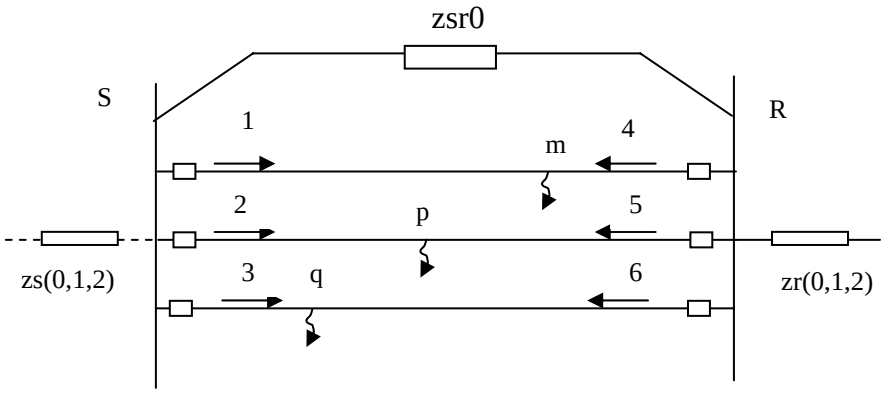
De otra forma, si q<=m y m<=p



z_{e0}(3,4)=zlM0*m;
z_{e0}(3,5)=zlM0*q;
z_{e0}(3,8)=-zlM0*(m-q);
z_{e0}(4,5)=zlM0*q;
z_{e0}(4,6)=-zlM0*(p-m);
z_{e0}(4,8)=-zlM0*(p-q);
z_{e0}(6,7)=zlM0*(1-p);
z_{e0}(6,8)=zlM0*(1-m);
z_{e0}(7,8)=zlM0*(1-p);

z_{e0}(4,3)= z_{e0}(3,4);
z_{e0}(5,3)= z_{e0}(3,5);
z_{e0}(8,3)= z_{e0}(3,8);
z_{e0}(5,4)= z_{e0}(4,5);
z_{e0}(6,4)= z_{e0}(4,6);
z_{e0}(8,4)= z_{e0}(4,8);
z_{e0}(7,6)= z_{e0}(6,7);
z_{e0}(8,6)= z_{e0}(6,8);
z_{e0}(8,7)= z_{e0}(7,8);

De otra forma, si q<=p y p<=m



z_{e0}(3,4)=zlM0*p;
z_{e0}(3,5)=zlM0*q;
z_{e0}(3,7)=-zlM0*(m-p);
z_{e0}(3,8)=-zlM0*(m-q);
z_{e0}(4,5)=zlM0*q;
z_{e0}(4,8)=-zlM0*(p-q);
z_{e0}(6,7)=zlM0*(1-m);
z_{e0}(6,8)=zlM0*(1-m);
z_{e0}(7,8)=zlM0*(1-p);

z_{e0}(4,3)= z_{e0}(3,4);
z_{e0}(5,3)= z_{e0}(3,5);
z_{e0}(7,3)= z_{e0}(3,7);
z_{e0}(8,3)= z_{e0}(3,8);
z_{e0}(5,4)= z_{e0}(4,5);
z_{e0}(8,4)= z_{e0}(4,8);
z_{e0}(7,6)= z_{e0}(6,7);
z_{e0}(8,6)= z_{e0}(6,8);
z_{e0}(8,7)= z_{e0}(7,8);

Independientemente de los valores de m, p, q se cumple:

$$Z_0 = \left(M_{inc}^t z_{e0}^{-1} M_{inc} \right)^{-1}$$

Secuencia 1:

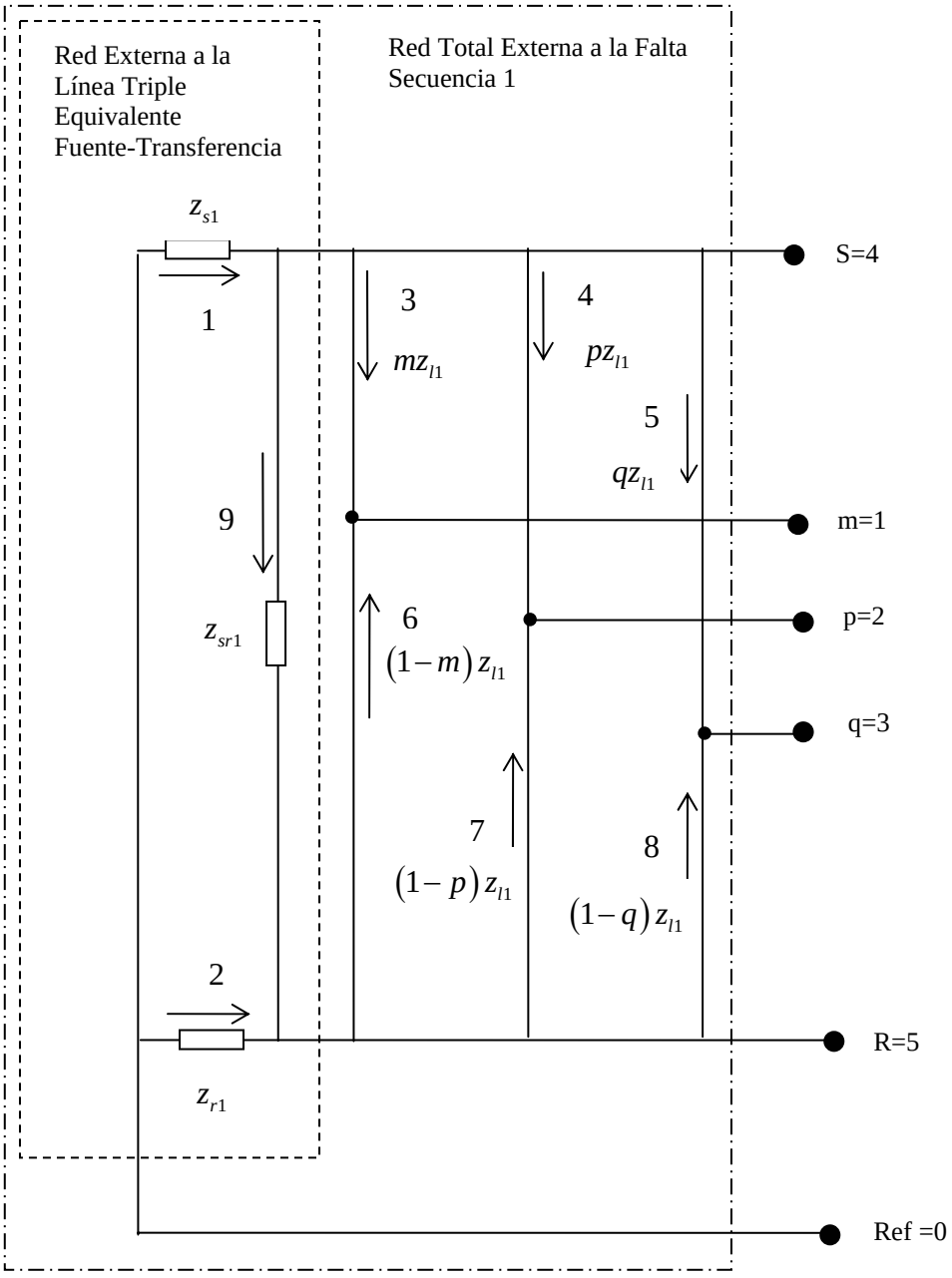


Fig 4.8.1.c

Z_1 = Matriz de Impedancia de Barras, Secuencia 1, de la Red Total Externa a la Falta

Determinación de Z_1 :

Conocidos:

- z_{s1}, z_{sr1}, z_{r1}
- Datos de la Línea Triple a la Secuencia 1
- Posición de la Falta (m,p,q)

z_{e1} = Matriz Primitiva de Impedancia de la Red Total Externa a la Falta (Sec. 1)

$$z_{e1} = \begin{bmatrix} z_{s1} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & z_{r1} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & mz_{l1} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & pz_{l1} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & qz_{l1} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & (1-m)z_{l1} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & (1-p)z_{l1} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & (1-q)z_{l1} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & z_{sr1} \end{bmatrix}$$

$$Z_1 = \left(M_{inc}^{t} z_{e1}^{-1} M_{inc} \right)^{-1}$$

Secuencia 2:

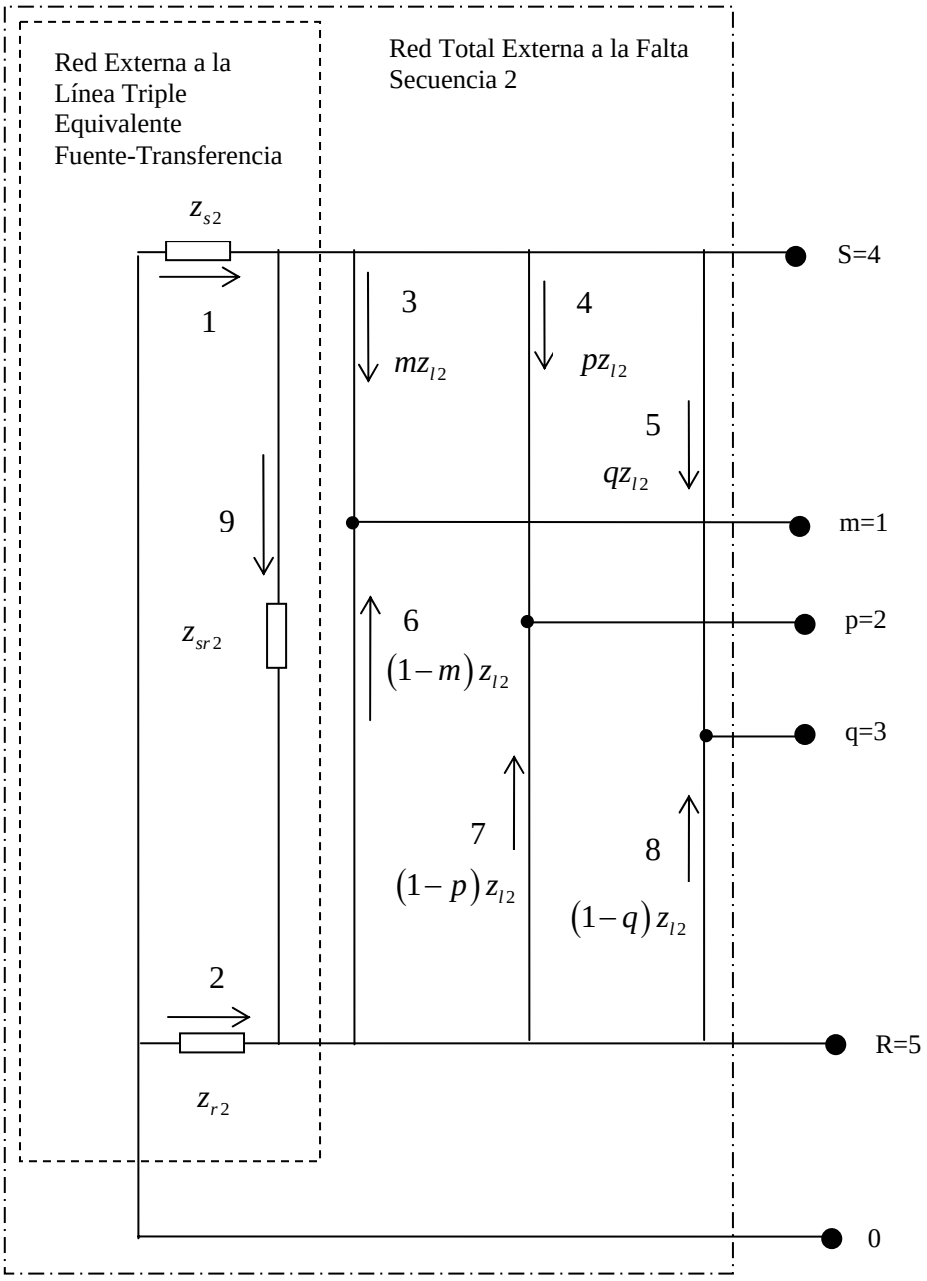


Fig 4.8.1.d

Z_2 = Matriz de Impedancia de Barras, Secuencia 2, de la Red Total Externa a la Falta

Determinación de Z_2:

Conocidos:

- z_{s2}, z_{sr2}, z_{r2}
- Datos de la Línea Triple a la Secuencia 2
- Posición de la Falta (m,p,q)

z_{e2} = Matriz Primitiva de Impedancia de la Red Total Externa a la Falta (Sec. 2)

$$z_{e2} = \begin{bmatrix} z_{s2} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & z_{r2} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & mz_{l2} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & pz_{l2} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & qz_{l2} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & (1-m)z_{l2} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & (1-p)z_{l2} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & (1-q)z_{l2} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & z_{sr2} \end{bmatrix}$$

$$Z_2 = \left(M_{inc}^{t} z_{e2}^{-1} M_{inc} \right)^{-1}$$

Caso 2: Impedancia de Transferencia Infinita

Sustituyendo la Red General Externa a la Línea Triple por su Equivalente de Fuentes Independientes S,R con Impedancia de Transferencia Infinita :

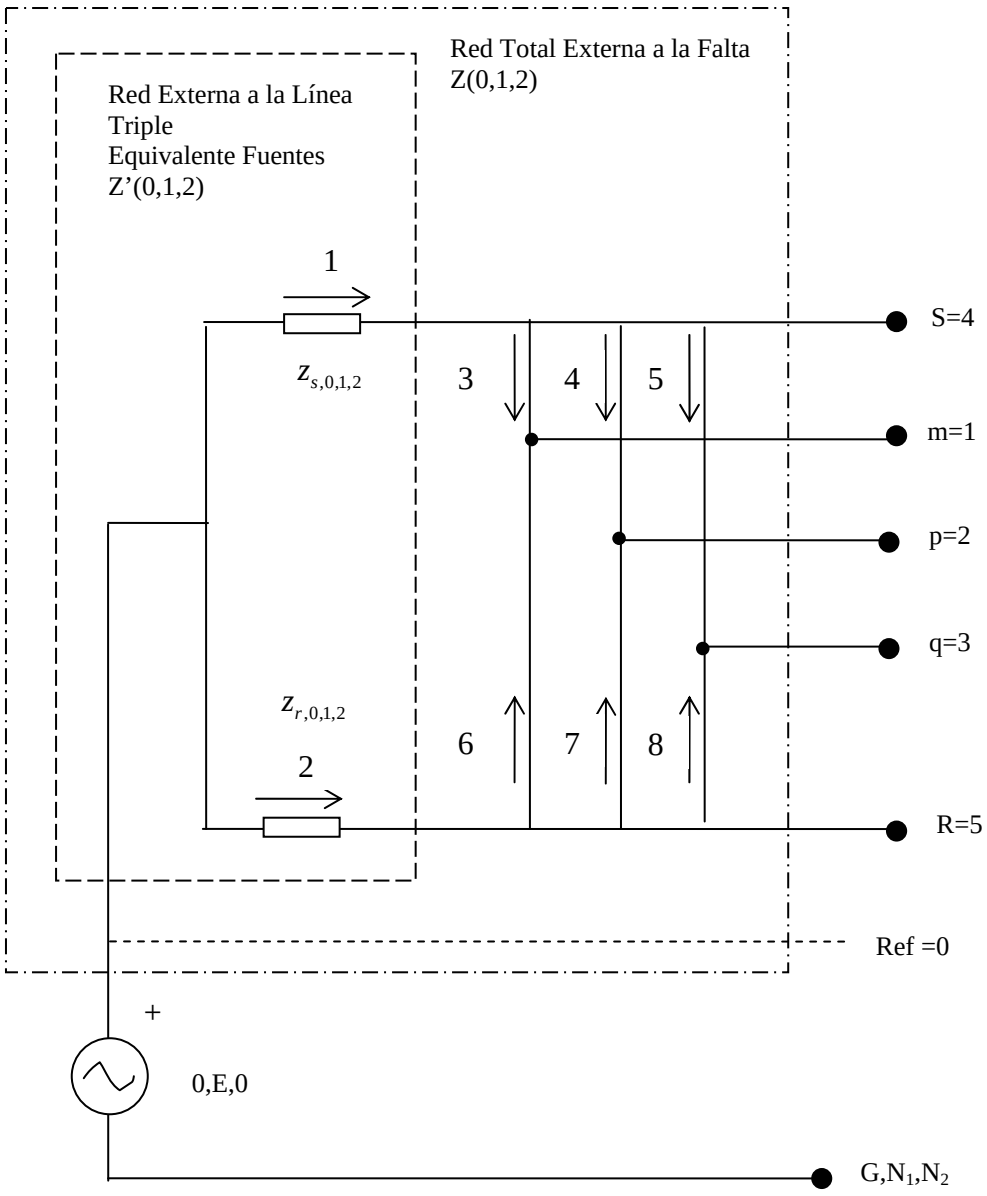


Fig. 4.8.1.e

Red Total Externa a la Falta (Secuencias 0,1,2):

- Numerar las Barras
  Barra 1= Punto de la Falta m
  Barra 2 = Punto de la Falta p
  Barra 3 = Punto de la Falta q
  Barra 4 = S
  Barra 5 = R

- Numerar y Orientar los Elementos

Elemento 1 = Ref-4
Elemento 2 = Ref-5
Elemento 3 = 4-1
Elemento 4 = 4-2
Elemento 5 = 4-3
Elemento 6 = 5-1
Elemento 7 = 5-2
Elemento 8 = 5-3

Matriz de Incidencia Elemento-Barra de la Red Total Externa a la Falta (Sec. 0,1,2)

$$M_{inc} = \begin{bmatrix} 0 & 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & 0 & -1 \\ -1 & 0 & 0 & 1 & 0 \\ 0 & -1 & 0 & 1 & 0 \\ 0 & 0 & -1 & 1 & 0 \\ -1 & 0 & 0 & 0 & 1 \\ 0 & -1 & 0 & 0 & 1 \\ 0 & 0 & -1 & 0 & 1 \end{bmatrix}$$

Secuencia 0:

Z_0 = Matriz de Impedancia de Barras, Secuencia 0, de la Red Total Externa a la Falta

Determinación de Z_0 :

Conocidos:
- z_{s0}, z_{r0}
- Datos de la Línea Triple a la Secuencia 0
- Posición de la Falta (m,p,q)

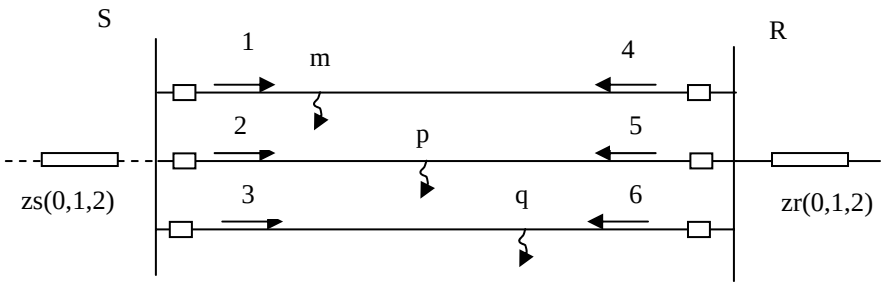
z_{e0} = Matriz Primitiva de Impedancia de la Red Total Externa a la Falta (Sec. 0)

Casos: posiciones relativas de m,p,q.
Se listan los Elementos no nulos de z_{e0} (8x8), para los diversos casos (Ver Fig. 4.8.1.e).

```
ze0(1,1)=zs0;
ze0(2,2)=zr0;
ze0(3,3)=zl0*m;
ze0(4,4)=zl0*p;
ze0(5,5)=zl0*q;
ze0(6,6)=zl0*(1-m);
ze0(7,7)=zl0*(1-p);
ze0(8,8)=zl0*(1-q);
```

Se listan a continuación los elementos no diagonales de z_{e0} para las distintas combinaciones que se pueden establecer entre los valores relativos de m, p, q :

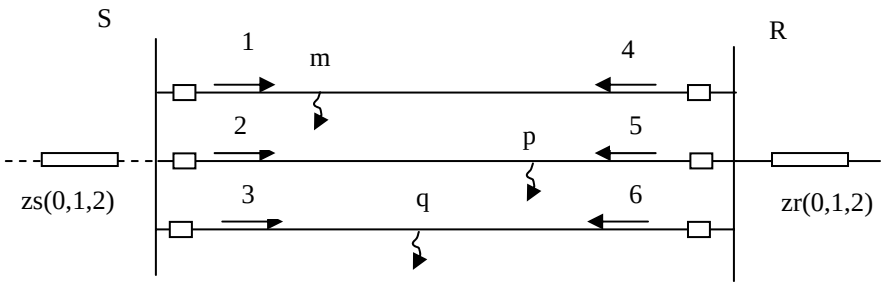
Si m<=p y p<=q



z_{e0}(3,4)=zlM0*m;
z_{e0}(3,5)=zlM0*m;
z_{e0}(4,5)=zlM0*p;
z_{e0}(4,6)=-zlM0*(p-m);
z_{e0}(5,6)=-zlM0*(q-m);
z_{e0}(5,7)=-zlM0*(q-p);
z_{e0}(6,7)=zlM0*(1-p);
z_{e0}(6,8)=zlM0*(1-q);
z_{e0}(7,8)=zlM0*(1-q);

z_{e0}(4,3)= z_{e0}(3,4);
z_{e0}(5,3)= z_{e0}(3,5);
z_{e0}(5,4)= z_{e0}(4,5);
z_{e0}(6,4)= z_{e0}(4,6);
z_{e0}(6,5)= z_{e0}(5,6);
z_{e0}(7,5)= z_{e0}(5,7);
z_{e0}(7,6)= z_{e0}(6,7);
z_{e0}(8,6)= z_{e0}(6,8);
z_{e0}(8,7)= z_{e0}(7,8);

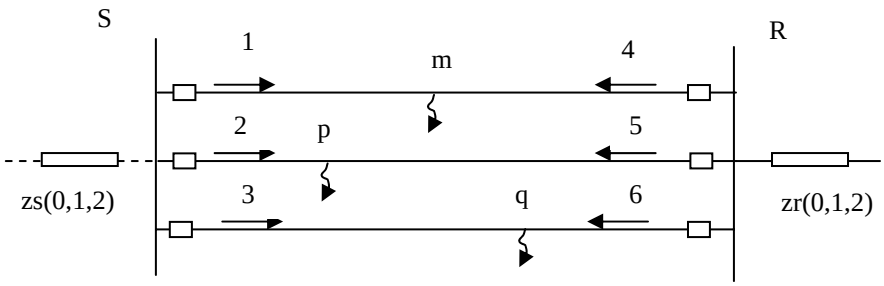
De otra forma, si m<=q y q<=p



z_{e0}(3,4)=zlM0*m;
z_{e0}(3,5)=zlM0*m;
z_{e0}(4,5)=zlM0*q;
z_{e0}(4,6)=-zlM0*(p-m);
z_{e0}(4,8)=-zlM0*(p-q);
z_{e0}(5,6)=-zlM0*(q-m);
z_{e0}(6,7)=zlM0*(1-p);
z_{e0}(6,8)=zlM0*(1-q);
z_{e0}(7,8)=zlM0*(1-p);

z_{e0}(4,3)= z_{e0}(3,4);
z_{e0}(5,3)= z_{e0}(3,5);
z_{e0}(5,4)= z_{e0}(4,5);
z_{e0}(6,4)= z_{e0}(4,6);
z_{e0}(8,4)= z_{e0}(4,8);
z_{e0}(6,5)= z_{e0}(5,6);
z_{e0}(7,6)= z_{e0}(6,7);
z_{e0}(8,6)= z_{e0}(6,8);
z_{e0}(8,7)= z_{e0}(7,8);

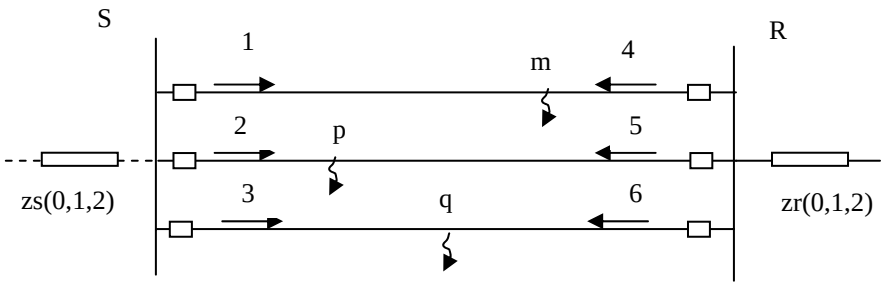
De otra forma,si p<=m y m<=q



z_{e0} (3,4)=zlM0*p;
z_{e0} (3,5)=zlM0*m;
z_{e0} (3,7)=-zlM0*(m-p);
z_{e0} (4,5)=zlM0*p;
z_{e0} (5,6)=-zlM0*(q-m);
z_{e0} (5,7)=-zlM0*(q-p);
z_{e0} (6,7)=zlM0*(1-m);
z_{e0} (6,8)=zlM0*(1-q);
z_{e0} (7,8)=zlM0*(1-q);

$z_{e0}(4,3)= z_{e0}(3,4)$;
$z_{e0}(5,3)= z_{e0}(3,5)$;
$z_{e0}(7,3)= z_{e0}(3,7)$;
$z_{e0}(5,4)= z_{e0}(4,5)$;
$z_{e0}(6,5)= z_{e0}(5,6)$;
$z_{e0}(7,5)= z_{e0}(5,7)$;
$z_{e0}(7,6)= z_{e0}(6,7)$;
$z_{e0}(8,6)= z_{e0}(6,8)$;
$z_{e0}(8,7)= z_{e0}(7,8)$;

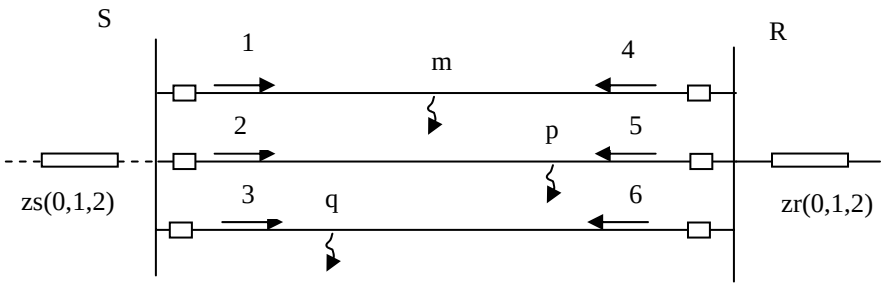
De otra forma,si p<=q y q<=m



z_{e0}(3,4)=zlM0*p;
z_{e0}(3,5)=zlM0*q;
z_{e0}(3,7)=-zlM0*(m-p);
z_{e0}(3,8)=-zlM0*(m-q);
z_{e0}(4,5)=zlM0*p;
z_{e0}(5,7)=-zlM0*(q-p);
z_{e0}(6,7)=zlM0*(1-m);
z_{e0}(6,8)=zlM0*(1-m);
z_{e0}(7,8)=zlM0*(1-q);

z_{e0}(4,3)= z_{e0}(3,4);
z_{e0}(5,3)= z_{e0}(3,5);
z_{e0}(7,3)= z_{e0}(3,7);
z_{e0}(8,3)= z_{e0}(3,8);
z_{e0}(5,4)= z_{e0}(4,5);
z_{e0}(7,5)= z_{e0}(5,7);
z_{e0}(7,6)= z_{e0}(6,7);
z_{e0}(8,6)= z_{e0}(6,8);
z_{e0}(8,7)= z_{e0}(7,8);

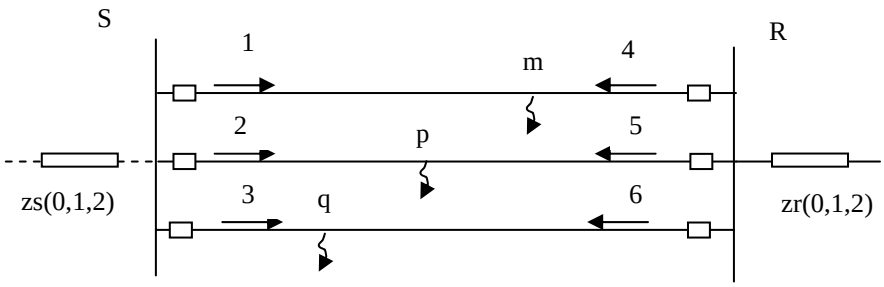
De otra forma, si q<=m y m<=p



z_{e0}(3,4)=zlM0*m;
z_{e0}(3,5)=zlM0*q;
z_{e0}(3,8)=-zlM0*(m-q);
z_{e0}(4,5)=zlM0*q;
z_{e0}(4,6)=-zlM0*(p-m);
z_{e0}(4,8)=-zlM0*(p-q);
z_{e0}(6,7)=zlM0*(1-p);
z_{e0}(6,8)=zlM0*(1-m);
z_{e0}(7,8)=zlM0*(1-p);

z_{e0}(4,3)= z_{e0}(3,4);
z_{e0}(5,3)= z_{e0}(3,5);
z_{e0}(8,3)= z_{e0}(3,8);
z_{e0}(5,4)= z_{e0}(4,5);
z_{e0}(6,4)= z_{e0}(4,6);
z_{e0}(8,4)= z_{e0}(4,8);
z_{e0}(7,6)= z_{e0}(6,7);
z_{e0}(8,6)= z_{e0}(6,8);
z_{e0}(8,7)= z_{e0}(7,8);

De otra forma, si q<=p y p<=m



z_{e0}(3,4)=zlM0*p;
z_{e0}(3,5)=zlM0*q;
z_{e0}(3,7)=-zlM0*(m-p);
z_{e0}(3,8)=-zlM0*(m-q);
z_{e0}(4,5)=zlM0*q;
z_{e0}(4,8)=-zlM0*(p-q);
z_{e0}(6,7)=zlM0*(1-m);
z_{e0}(6,8)=zlM0*(1-m);
z_{e0}(7,8)=zlM0*(1-p);

z_{e0}(4,3)= z_{e0}(3,4);
z_{e0}(5,3)= z_{e0}(3,5);
z_{e0}(7,3)= z_{e0}(3,7);
z_{e0}(8,3)= z_{e0}(3,8);
z_{e0}(5,4)= z_{e0}(4,5);
z_{e0}(8,4)= z_{e0}(4,8);
z_{e0}(7,6)= z_{e0}(6,7);
z_{e0}(8,6)= z_{e0}(6,8);
z_{e0}(8,7)= z_{e0}(7,8);

Independientemente de los valores de m, p, q se cumple:

$$Z_0 = \left(M_{inc}^t z_{e0}^{-1} M_{inc} \right)^{-1}$$

Secuencia 1:

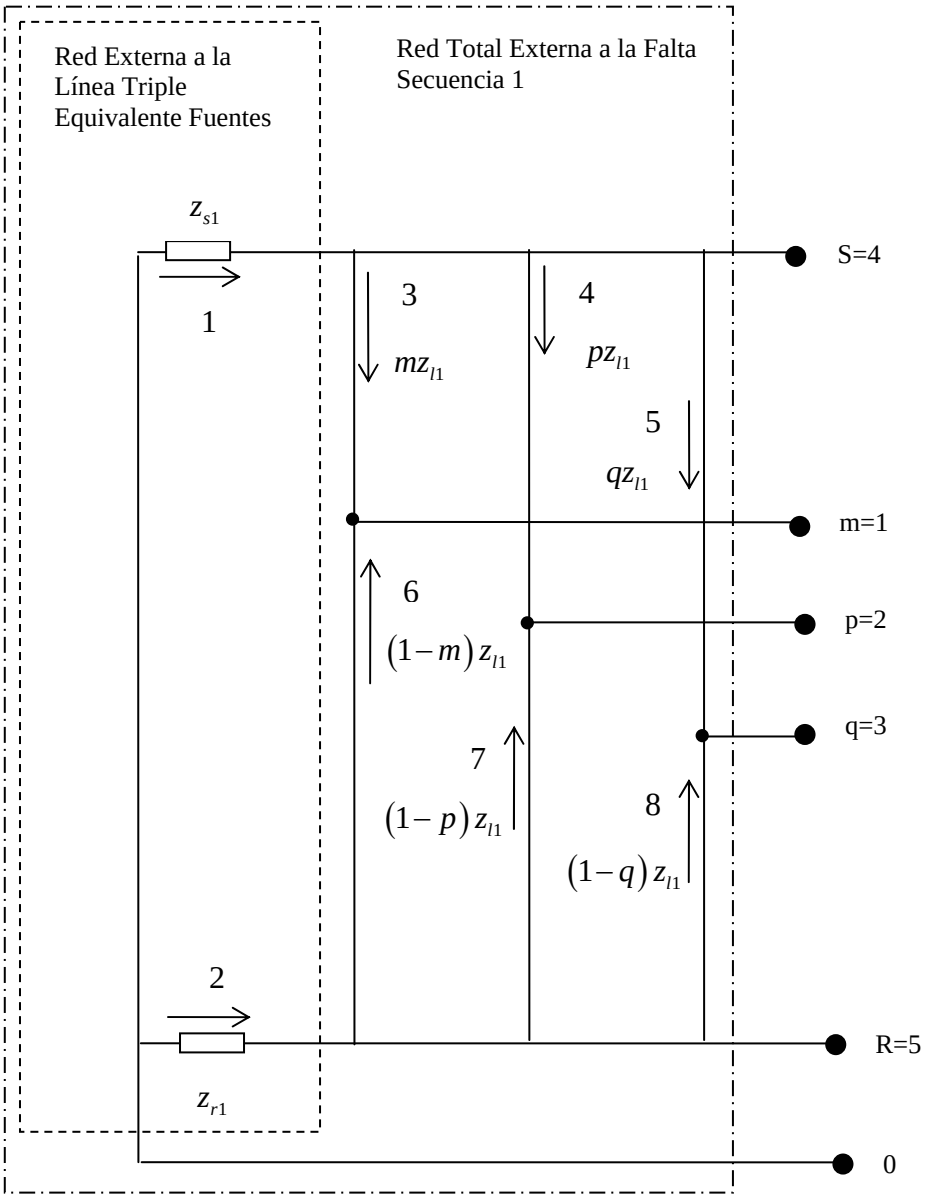


Fig 4.8.1.f

Z_1 = Matriz de Impedancia de Barras, Secuencia 1, de la Red Total Externa a la Falta

Determinación de Z_1 :

Conocidos:

- z_{s1}, z_{r1}
- Datos de la Línea Triple a la Secuencia 1
- Posición de la Falta (m,p,q)

z_{e1} = Matriz Primitiva de Impedancia de la Red Total Externa a la Falta (Sec. 1)

$$z_{e1} = \begin{bmatrix} z_{s1} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & z_{r1} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & mz_{l1} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & pz_{l1} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & qz_{l1} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & (1-m)z_{l1} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & (1-p)z_{l1} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & (1-q)z_{l1} \end{bmatrix}$$

$$Z_1 = \left(M_{inc}^{t} z_{e1}^{-1} M_{inc} \right)^{-1}$$

Secuencia 2:

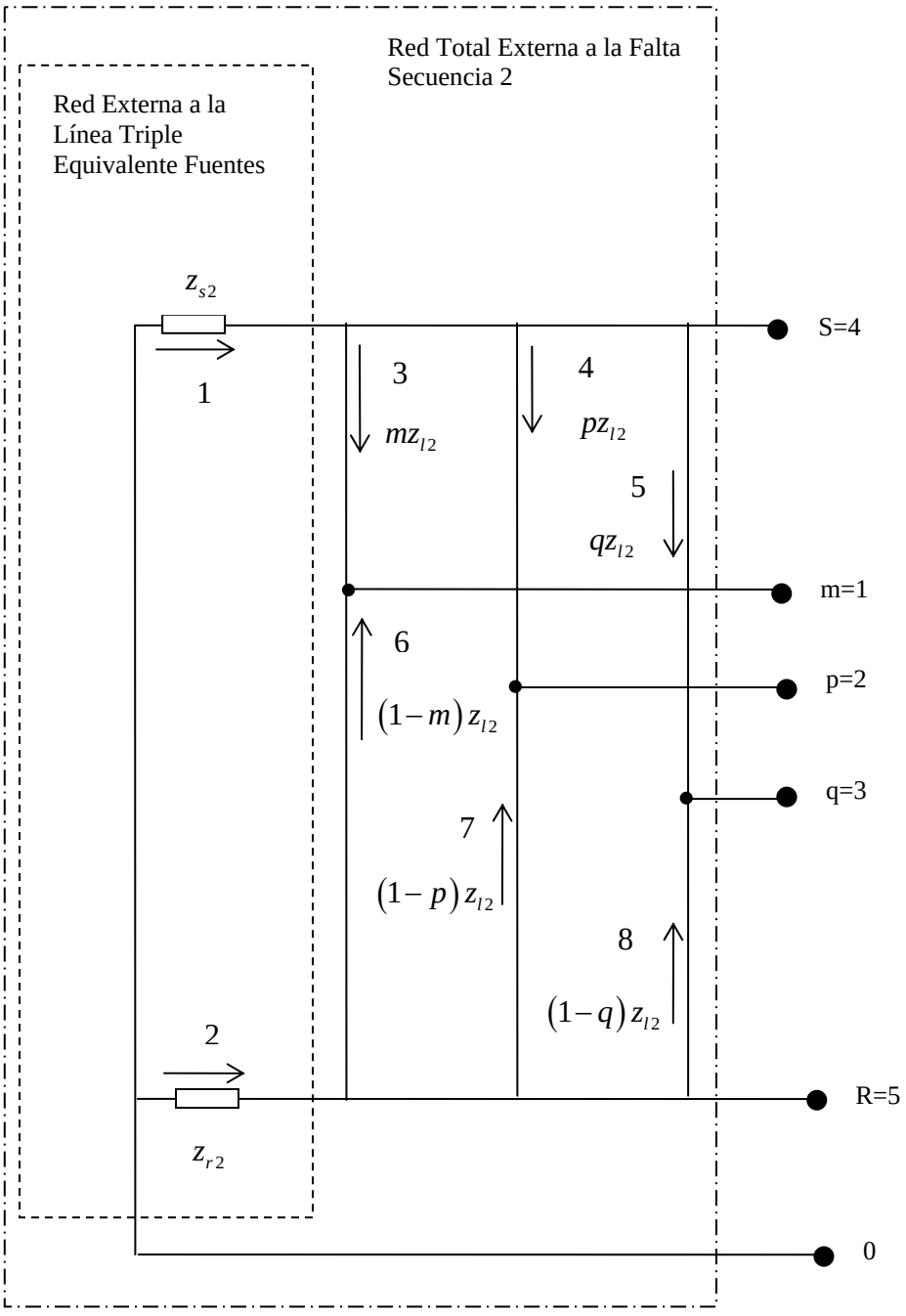


Fig 4.8.1.g

Z_2 = Matriz de Impedancia de Barras, Secuencia 2, de la Red Total Externa a la Falta

Determinación de Z_2:

Conocidos:

- z_{s2}, z_{r2}
- Datos de la Línea Triple a la Secuencia 2
- Posición de la Falta (m,p,q)

z_{e2} = Matriz Primitiva de Impedancia de la Red Total Externa a la Falta (Sec. 2)

$$z_{e2} = \begin{bmatrix} z_{s2} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & z_{r2} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & mz_{l2} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & pz_{l2} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & qz_{l2} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & (1-m)z_{l2} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & (1-p)z_{l2} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & (1-q)z_{l2} \end{bmatrix}$$

$$Z_2 = \left(M_{inc}^{t} z_{e2}^{-1} M_{inc} \right)^{-1}$$