Universidad de Santiago de Chile
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Sistemas Eléctricos de Potencia

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Tarea 4: Flujo de Potencia por Método de Gauss Seidel

Resolución de Ejercicio

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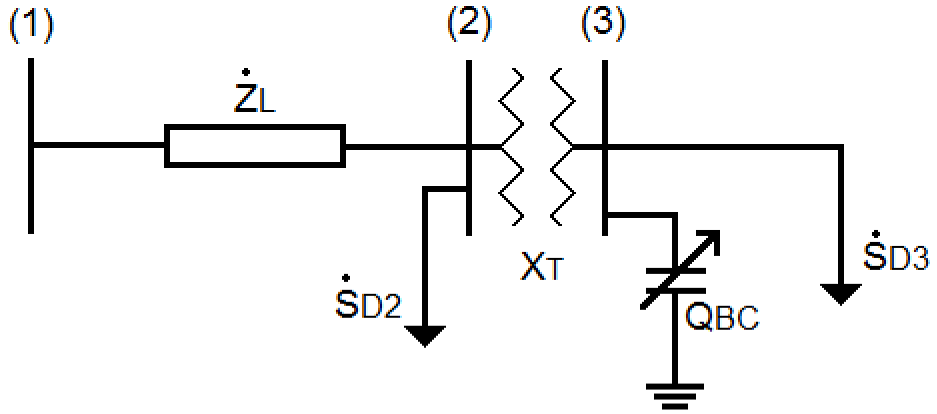
Enunciado:

Para el SEP de la Figura:



Datos:
$V_1^0 = 1\angle 0°$; $V_2^0 = 1\angle 0°$; $V_3^0 = 0{,}95\angle 0°$
L: $\dot{Z}_L = 0{,}161 + j0{,}327\ [p.u]$; $66\ [KV]$; $100\ [MVA]$
T: $X_T = 0{,}8\ \%$; $66/\ 12\ [KV]$; $40\ [MVA]$
C_2: $10\ [MVA]$; $cos(\varphi) = 0{,}9(i)$
C_3: $30\ [MVA]$; $cos(\varphi) = 0{,}8(i)$

1. Calcular los voltajes de las Barras 2 y 3, para 10 iteraciones (K=9).

2. Graficar:
- La magnitud del voltaje en la Barra 2
- La magnitud del voltaje en la Barra 3
- El ángulo del voltaje en la Barra 2
- El ángulo del voltaje en la Barra 3
- La potencia reactiva Q_3
- La potencia reactiva Q_{BC}

Solución:

1.- Para llevar los parámetros del sistema a base común, dado que S_{Base} = 100 MVA, definimos que $S_{B1} = 66\ KV$, para la línea, por tanto $Z_L\,(p.u)$ queda igual.

$$\dot{Z}_L\ (p.u) = 0{,}161 + j0{,}327\ [p.u]$$

$$X_T(p.u) = X_{Ta}\cdot\left(\frac{V_{Ba}}{V_{Bn}}\right)^2\cdot\frac{S_{Bn}}{S_{Ba}}$$

$$X_T(p.u) = 0{,}088\cdot\left(\frac{66}{66}\right)^2\cdot\frac{100}{40} = 0{,}22\ [p.u]$$

$$\dot{S}_{D2} = \frac{10}{100}\cdot\angle\, cos^{-1}(0{,}9) = 0{,}1\angle\, 25{,}8419°\ \ [p.u]$$

$$\dot{S}_{D2} = 0{,}09 + j0{,}0435\ [p.u] \Rightarrow P_{D2} = 0{,}09\ ;\ Q_{D2} = 0{,}0435$$

$$\dot{S}_{D3} = \frac{30}{100}\cdot\angle\, cos^{-1}(0{,}8) = 0{,}3\angle\, 36{,}8698°\ \ [p.u]$$

$$\dot{S}_{D3} = 0{,}24 + j0{,}18\ [p.u] \Rightarrow P_{D3} = 0{,}24\ ;\ Q_{D3} = 0{,}18$$

Como existen 3 barras en el sistema, la matriz admitancias de Barra quedará de 3x3.

$$\left[\dot{Y}_B\right] = \begin{bmatrix}\dot{Y}_{11} & \dot{Y}_{12} & \dot{Y}_{13}\\ \dot{Y}_{21} & \dot{Y}_{22} & \dot{Y}_{23}\\ \dot{Y}_{31} & \dot{Y}_{32} & \dot{Y}_{33}\end{bmatrix}$$

$$\dot{Y}_{11} = \frac{1}{\dot{Z}_L}\quad ;\quad \dot{Y}_{12} = -\frac{1}{\dot{Z}_L}\quad ;\quad \dot{Y}_{13} = 0$$

$$\dot{Y}_{21} = -\frac{1}{\dot{Z}_L}\quad ;\quad \dot{Y}_{22} = \frac{1}{\dot{Z}_L} + \frac{1}{\dot{Z}_T}\quad ;\quad \dot{Y}_{23} = -\frac{1}{\dot{Z}_T}$$

$$\dot{Y}_{31} = 0\quad ;\quad \dot{Y}_{32} = -\frac{1}{\dot{Z}_T}\quad ;\quad \dot{Y}_{33} = \frac{1}{\dot{Z}_T}$$

$$\dot{Z}_L\ (p.u) = 0{,}161 + j0{,}327\ [p.u] \Rightarrow \frac{1}{\dot{Z}_L} = 2{,}7435\angle -63{,}7864°$$

$$jX_T\ (p.u) = j0{,}22\ [p.u] \Rightarrow \frac{1}{jX_T} = j4{,}5454 = 4{,}5454\angle -90°$$

$$\frac{1}{\dot{Z}_L} + \frac{1}{jX_T} = \frac{1}{0{,}161 + j0{,}327} + \frac{1}{j0{,}22} = 7{,}1109\angle -80{,}1873°$$

Finalmente la Matriz Admitancias de Barra nos queda:

$$[\dot{Y}_B] = \begin{bmatrix} 2{,}7435\angle -63{,}7864° & 2{,}7435\angle\, 116{,}2136° & 0 \\ 2{,}7435\angle\, 116{,}2136° & 7{,}1109\angle -80{,}1873° & 4{,}5454\angle\, 90° \\ 0 & 4{,}5454\angle\, 90° & 4{,}5454\angle -90° \end{bmatrix}$$

Ahora desarrollaremos el cuadro resumen del sistema:

$\boldsymbol{Barra}$	$\boldsymbol{V}$	$\boldsymbol{\delta}$	$\boldsymbol{P_G}$	$\boldsymbol{Q_G}$	$\boldsymbol{P_D}$	$\boldsymbol{Q_D}$	$\boldsymbol{P_N}$	$\boldsymbol{Q_N}$
1	1	0	P_{G1}	Q_{G1}	0	0	$P_{G1} - 0$	$Q_{G1} - 0$
2	V_2	δ_2	0	Q_{G1}	P_{D2}	Q_{D2}	$0 - P_{D2}$	$0 - Q_{D2}$
3	0,95	δ_3	0	Q_{BC}	P_{D3}	Q_{D3}	$0 - P_{D3}$	$Q_{BC} - Q_{D3}$

Y conociendo que:

$P_{D2} = 0{,}09$
$Q_{D2} = 0{,}0435$

$P_{D3} = 0{,}24$
$Q_{D3} = 0{,}18$

Entonces remplazando los valores nos queda:

$\boldsymbol{Barra}$	$\boldsymbol{V}$	$\boldsymbol{\delta}$	$\boldsymbol{P_G}$	$\boldsymbol{Q_G}$	$\boldsymbol{P_D}$	$\boldsymbol{Q_D}$	$\boldsymbol{P_N}$	$\boldsymbol{Q_N}$
1	1	0	P_{G1}	Q_{G1}	0	0	P_{G1}	Q_{G1}
2	V_2	δ_2	0	Q_{G1}	0,09	0,0435	$-0{,}09$	$-0{,}0435$
3	0,95	δ_3	0	Q_{BC}	0,24	0,18	$-0{,}24$	$Q_{BC} - 0{,}18$

Tipos de Barras en este problema:

$\boldsymbol{Barra}$	$\boldsymbol{Tipo}$
1	$Libre$
2	PQ
3	PV

Ahora debemos desarrollar la Ecuación de Gauss – Seidel, para barras PQ como PV las Cuales Son:

Para barras **PQ**:

$$\dot{V}_p{}^{(k+1)} = \frac{1}{\dot{Y}_{pp}} \cdot \left[\left(\frac{\dot{S}_p}{\dot{V}_p{}^{(k)}} \right)^* - \sum_{q=1}^{p-1} \dot{Y}_{pq} \cdot \dot{V}_q{}^{(k+1)} - \sum_{q=p+1}^{n} \dot{Y}_{pq} \cdot \dot{V}_q{}^{(k)} \right]$$

Cuando existen barras **PV**, hay que trabajar con estas 2 ecuaciones:

$$Q_p{}^{(k+1)} = -Im \left[\left(\dot{V}_p{}^{(k)} \right)^* \cdot \left(\sum_{q=1}^{p-1} \dot{Y}_{pq} \cdot \dot{V}_q{}^{(k+1)} + \sum_{q=p}^{n} \dot{Y}_{pq} \cdot \dot{V}_q{}^{(k)} \right) \right]$$

$$\dot{V}_p{}^{(k+1)} = \frac{1}{\dot{Y}_{pp}} \cdot \left[\left(\frac{\dot{S}_p{}^{(k+1)}}{\dot{V}_p{}^{(k)}} \right)^* - \sum_{q=1}^{p-1} \dot{Y}_{pq} \cdot \dot{V}_q{}^{(k+1)} - \sum_{q=p+1}^{n} \dot{Y}_{pq} \cdot \dot{V}_q{}^{(k)} \right]$$

Para la Barra 2 (Barra PQ), nos queda:

$$\dot{V}_p{}^{(k+1)} = \frac{1}{\dot{Y}_{pp}} \cdot \left[\left(\frac{\dot{S}_p}{\dot{V}_p{}^{(k)}} \right)^* - \sum_{q=1}^{p-1} \dot{Y}_{pq} \cdot \dot{V}_q{}^{(k+1)} - \sum_{q=p+1}^{n} \dot{Y}_{pq} \cdot \dot{V}_q{}^{(k)} \right]$$

$$\dot{V}_2{}^{(k+1)} = \frac{1}{\dot{Y}_{22}} \cdot \left[\left(\frac{\dot{S}_2}{\dot{V}_2{}^{(k)}} \right)^* - \sum_{q=1}^{2-1} \dot{Y}_{2q} \cdot \dot{V}_q{}^{(k+1)} - \sum_{q=2+1}^{3} \dot{Y}_{2q} \cdot \dot{V}_q{}^{(k)} \right]$$

$$\dot{V}_2{}^{(k+1)} = \frac{1}{\dot{Y}_{22}} \cdot \left[\left(\frac{\dot{S}_2}{\dot{V}_2{}^{(k)}} \right)^* - \sum_{q=1}^{1} \dot{Y}_{2q} \cdot \dot{V}_q{}^{(k+1)} - \sum_{q=3}^{3} \dot{Y}_{2q} \cdot \dot{V}_q{}^{(k)} \right]$$

$$\dot{V}_2{}^{(k+1)} = \frac{1}{\dot{Y}_{22}} \cdot \left[\left(\frac{\dot{S}_2}{\dot{V}_2{}^{(k)}} \right)^* - \dot{Y}_{21} \cdot \dot{V}_1{}^{(k+1)} - \left(\dot{Y}_{23} \cdot \dot{V}_3{}^{(k)} \right) \right]$$

Quedando la ecuación de voltajes en la ***Barra 2*** para k iteraciones, así:

$$\dot{V}_2{}^{(k+1)} = \frac{1}{\dot{Y}_{22}} \cdot \left[\left(\frac{\dot{S}_2}{\dot{V}_2{}^{(k)}} \right)^* - \dot{Y}_{21} \cdot \dot{V}_1{}^{(k+1)} - \dot{Y}_{23} \cdot \dot{V}_3{}^{(k)} \right]$$

Para la Barra 3 (Barra PV), aquí necesitaremos el cálculo previo de Q:

$$Q_3^{(k+1)} = -Im\left[\left(\dot{V}_3^{(k)}\right)^* \cdot \left(\sum_{q=1}^{3-1} \dot{Y}_{3q} \cdot \dot{V}_q^{(k+1)} + \sum_{q=3}^{3} \dot{Y}_{3q} \cdot \dot{V}_q^{(k)}\right)\right]$$

$$Q_3^{(k+1)} = -Im\left[\left(\dot{V}_3^{(k)}\right)^* \cdot \left(\sum_{q=1}^{2} \dot{Y}_{3q} \cdot \dot{V}_q^{(k+1)} + \sum_{q=3}^{3} \dot{Y}_{3q} \cdot \dot{V}_q^{(k)}\right)\right]$$

En este punto obtenemos la Potencia Reactiva que necesitamos:

$$Q_3^{(k+1)} = -Im\left[\left(\dot{V}_3^{(k)}\right)^* \cdot \left(\dot{Y}_{31} \cdot \dot{V}_1^{(k+1)} + \dot{Y}_{32} \cdot \dot{V}_2^{(k+1)} + \dot{Y}_{33} \cdot \dot{V}_3^{(k)}\right)\right]$$

Ahora podemos desarrollar los voltajes de Barras según la primera ecuación:

$$\dot{V}_3^{(k+1)} = \frac{1}{\dot{Y}_{33}} \cdot \left[\left(\frac{\dot{S}_3}{\dot{V}_3^{(k)}}\right)^* - \sum_{q=1}^{3-1} \dot{Y}_{3q} \cdot \dot{V}_q^{(k+1)} - \sum_{q=3+1}^{3} \dot{Y}_{3q} \cdot \dot{V}_q^{(k)}\right]$$

$$\dot{V}_3^{(k+1)} = \frac{1}{\dot{Y}_{33}} \cdot \left[\left(\frac{\dot{S}_3}{\dot{V}_3^{(k)}}\right)^* - \sum_{q=1}^{2} \dot{Y}_{3q} \cdot \dot{V}_q^{(k+1)} - \sum_{q=4}^{3} \dot{Y}_{3q} \cdot \dot{V}_q^{(k)}\right]$$

$$\dot{V}_3^{(k+1)} = \frac{1}{\dot{Y}_{33}} \cdot \left[\left(\frac{\dot{S}_3}{\dot{V}_3^{(k)}}\right)^* - \left(\dot{Y}_{31} \cdot \dot{V}_1^{(k+1)} + \dot{Y}_{32} \cdot \dot{V}_2^{(k+1)}\right)\right]$$

Quedando la ecuación de voltajes en la ***Barra 3*** para k iteraciones, así:

$$\dot{V}_3^{(k+1)} = \frac{1}{\dot{Y}_{33}} \cdot \left[\left(\frac{\dot{S}_3}{\dot{V}_3^{(k)}}\right)^* - \dot{Y}_{31} \cdot \dot{V}_1^{(k+1)} - \dot{Y}_{32} \cdot \dot{V}_2^{(k+1)}\right]$$

Iniciaremos las iteraciones con K = 0 y llegaremos a K = 9, es decir, realizaremos 10 iteraciones.

Para K = 0, nos queda:

$V_1^0 = 1\angle 0°$; $V_2^0 = 1\angle 0°$; $V_3^0 = 0{,}95\angle 0°$
Y conociendo que:
$V_1^0 = V_1^1 = V_1^2 = \cdots = V_1^{(k)} = V_1^{(k+1)} = 1\angle 0°$

Desarrollaremos la iteración:

$$\dot{V}_p{}^{(k+1)} = \frac{1}{\dot{Y}_{pp}} \cdot \left[\left(\frac{\dot{S}_p}{\dot{V}_p{}^{(k)}} \right)^* - \sum_{q=1}^{p-1} \dot{Y}_{pq} \cdot \dot{V}_q{}^{(k+1)} - \sum_{q=p+1}^{n} \dot{Y}_{pq} \cdot \dot{V}_q{}^{(k)} \right]$$

$$\dot{V}_2{}^{(1)} = \frac{1}{\dot{Y}_{22}} \cdot \left[\left(\frac{\dot{S}_2}{\dot{V}_2{}^{(0)}} \right)^* - \sum_{q=1}^{1} \dot{Y}_{2q} \cdot \dot{V}_q{}^{(1)} - \sum_{q=3}^{3} \dot{Y}_{2q} \cdot \dot{V}_q{}^{(0)} \right]$$

$$\dot{V}_2{}^{(1)} = \frac{1}{\dot{Y}_{22}} \cdot \left[\left(\frac{\dot{S}_2}{\dot{V}_2{}^{(0)}} \right)^* - \dot{Y}_{21} \cdot \dot{V}_1{}^{(1)} - \dot{Y}_{23} \cdot \dot{V}_3{}^{(0)} \right]$$

$$\dot{V}_2{}^{(1)} = \frac{1}{7{,}1109\angle -80{,}1873} \cdot \left[\left(\frac{-0{,}09 - j0{,}0435}{(1\angle 0)} \right)^* - (2{,}7435\angle\, 116{,}2136) \cdot (1\angle 0) - (4{,}5454\angle\, 90) \cdot (0{,}95\angle 0) \right]$$

$$\dot{V}_2{}^{(1)} = 0{,}9603\angle -0{,}3571\ (p.u)$$

$$Q_p{}^{(k+1)} = -Im\left[\left(\dot{V}_p{}^{(k)} \right)^* \cdot \left(\sum_{q=1}^{p-1} \dot{Y}_{pq} \cdot \dot{V}_q{}^{(k+1)} + \sum_{q=p}^{n} \dot{Y}_{pq} \cdot \dot{V}_q{}^{(k)} \right) \right]$$

$$Q_3{}^{(1)} = -Im\left[\left(\dot{V}_3{}^{(0)} \right)^* \cdot \left(\sum_{q=1}^{2} \dot{Y}_{3q} \cdot \dot{V}_q{}^{(1)} + \sum_{q=3}^{3} \dot{Y}_{3q} \cdot \dot{V}_q{}^{(0)} \right) \right]$$

$$Q_3{}^{(1)} = -Im\left[\left(\dot{V}_3{}^{(0)} \right)^* \cdot \left(\dot{Y}_{31} \cdot \dot{V}_1{}^{(1)} + \dot{Y}_{32} \cdot \dot{V}_2{}^{(1)} + \dot{Y}_{33} \cdot \dot{V}_3{}^{(0)} \right) \right]$$

$$Q_3{}^{(1)} = -Im[(0{,}95\angle 0)^* \cdot (0 \cdot (1\angle 0) + (4{,}5454\angle\, 90°) \cdot (0{,}9603\angle -0{,}3571) + (4{,}5454\angle -90) \cdot (0{,}95\angle 0))]$$

$$Q_3{}^{(1)} = -0{,}0444\ (p.u)$$

$$S_3{}^{(k+1)} = -0{,}24 + jQ_3{}^{(k+1)}$$
$$Q_{BC}{}^{(k+1)} = Q_3{}^{(k+1)} + 0{,}18\ (p.u)$$

$$Q_{BC}{}^{(1)} = Q_3{}^{(1)} + 0{,}18\ (p.u) = 0{,}1356\ (p.u)$$

$$S_3{}^{(1)} = -0{,}24 + jQ_3{}^{(1)} = -0{,}24 - j0{,}0444\ (p.u) = 0{,}2440\angle -169{,}5187\ \ (p.u)$$

$$\dot{V}_p^{\ (k+1)} = \frac{1}{\dot{Y}_{pp}} \cdot \left[\left(\frac{\dot{S}_p^{\ (k+1)}}{\dot{V}_p^{\ (k)}} \right)^* - \sum_{q=1}^{p-1} \dot{Y}_{pq} \cdot \dot{V}_q^{\ (k+1)} - \sum_{q=p+1}^{n} \dot{Y}_{pq} \cdot \dot{V}_q^{\ (k)} \right]$$

$$\dot{V}_3^{\ (1)} = \frac{1}{\dot{Y}_{33}} \cdot \left[\left(\frac{\dot{S}_3^{\ (1)}}{\dot{V}_3^{\ (0)}} \right)^* - \sum_{q=1}^{2} \dot{Y}_{3q} \cdot \dot{V}_q^{\ (1)} - \sum_{q=4}^{3} \dot{Y}_{3q} \cdot \dot{V}_q^{\ (0)} \right]$$

$$\dot{V}_3^{\ (1)} = \frac{1}{\dot{Y}_{33}} \cdot \left[\left(\frac{\dot{S}_3^{\ (1)}}{\dot{V}_3^{\ (0)}} \right)^* - \dot{Y}_{31} \cdot \dot{V}_1^{\ (1)} - \dot{Y}_{32} \cdot \dot{V}_2^{\ (1)} \right]$$

$$\dot{V}_3^{\ (1)} = \frac{1}{4{,}5454\angle -90} \cdot \left[\left(\frac{-0{,}24 - j0{,}0444}{0{,}95\angle 0} \right)^* - 0 \cdot (1\angle 0) - (4{,}5454\angle\, 90) \cdot (0{,}9603\angle -0{,}3571) \right]$$

$$\dot{V}_3^{\ (1)} = 0{,}9520\angle -3{,}7079$$

Por lo tanto:

$$\dot{V}_3^{\ (1)} = 0{,}95\angle -3{,}7079 \ \ (p.u)$$

$\dot{V}_2{}^{(1)} = 0{,}9603\angle - 0{,}3571\ (p.u)$ $\qquad\qquad$ $\dot{V}_3{}^{(1)} = 0.95\angle - 3{,}7079\ (p.u)$

Para K = 1, nos queda:

$$\dot{V}_p{}^{(k+1)} = \frac{1}{\dot{Y}_{pp}} \cdot \left[\left(\frac{\dot{S}_p}{\dot{V}_p{}^{(k)}} \right)^* - \sum_{q=1}^{p-1} \dot{Y}_{pq} \cdot \dot{V}_q{}^{(k+1)} - \sum_{q=p+1}^{n} \dot{Y}_{pq} \cdot \dot{V}_q{}^{(k)} \right]$$

$$\dot{V}_2{}^{(2)} = \frac{1}{\dot{Y}_{22}} \cdot \left[\left(\frac{\dot{S}_2}{\dot{V}_2{}^{(1)}} \right)^* - \sum_{q=1}^{1} \dot{Y}_{2q} \cdot \dot{V}_q{}^{(2)} - \sum_{q=3}^{3} \dot{Y}_{2q} \cdot \dot{V}_q{}^{(1)} \right]$$

$$\dot{V}_2{}^{(2)} = \frac{1}{\dot{Y}_{22}} \cdot \left[\left(\frac{\dot{S}_2}{\dot{V}_2{}^{(1)}} \right)^* - \dot{Y}_{21} \cdot \dot{V}_1{}^{(2)} - \dot{Y}_{23} \cdot \dot{V}_3{}^{(1)} \right]$$

$$\dot{V}_2{}^{(2)} = \frac{1}{7{,}1109\angle - 80{,}1873} \cdot \left[\left(\frac{-0{,}09 - j0{,}0435}{(0{,}9603\angle - 0{,}3571)} \right)^* - (2{,}7435\angle\ 116{,}2136) \cdot (1\angle 0) - (4{,}5454\angle\ 90) \cdot (0.95\angle - 3{,}7079) \right]$$

$\dot{V}_2{}^{(2)} = 0{,}9530\angle - 2{,}6995\ (p.u)$

$$Q_p{}^{(k+1)} = -Im\left[\left(\dot{V}_p{}^{(k)} \right)^* \cdot \left(\sum_{q=1}^{p-1} \dot{Y}_{pq} \cdot \dot{V}_q{}^{(k+1)} + \sum_{q=p}^{n} \dot{Y}_{pq} \cdot \dot{V}_q{}^{(k)} \right) \right]$$

$$Q_3{}^{(2)} = -Im\left[\left(\dot{V}_3{}^{(1)} \right)^* \cdot \left(\sum_{q=1}^{2} \dot{Y}_{3q} \cdot \dot{V}_q{}^{(2)} + \sum_{q=3}^{3} \dot{Y}_{3q} \cdot \dot{V}_q{}^{(1)} \right) \right]$$

$$Q_3{}^{(2)} = -Im\left[\left(\dot{V}_3{}^{(1)} \right)^* \cdot \left(\dot{Y}_{31} \cdot \dot{V}_1{}^{(2)} + \dot{Y}_{32} \cdot \dot{V}_2{}^{(2)} + \dot{Y}_{33} \cdot \dot{V}_3{}^{(1)} \right) \right]$$

$$Q_3{}^{(2)} = -Im[(0.95\angle - 3{,}7079)^* \cdot (0 \cdot (1\angle 0) + (4{,}5454\angle\ 90°) \cdot (0{,}9530\angle - 2{,}6995) + (4{,}5454\angle - 90) \cdot (0.95\angle - 3{,}7079))]$$

$Q_3{}^{(2)} = -0{,}0123\ (p.u)$

$$S_3{}^{(k+1)} = -0{,}24 + jQ_3{}^{(k+1)}$$
$$Q_{BC}{}^{(k+1)} = Q_3{}^{(k+1)} + 0{,}18\ (p.u)$$

$Q_{BC}{}^{(2)} = Q_3{}^{(2)} + 0{,}18\ (p.u) = 0{,}1677\ (p.u)$

$S_3{}^{(2)} = -0{,}24 + jQ_3{}^{(2)} = -0{,}24 - j0{,}0123\ (p.u) = 0{,}2403\angle - 177{,}0661\ \ (p.u)$

$$\dot{V}_p^{\ (k+1)} = \frac{1}{\dot{Y}_{pp}} \cdot \left[\left(\frac{\dot{S}_p^{\ (k+1)}}{\dot{V}_p^{\ (k)}} \right)^* - \sum_{q=1}^{p-1} \dot{Y}_{pq} \cdot \dot{V}_q^{\ (k+1)} - \sum_{q=p+1}^{n} \dot{Y}_{pq} \cdot \dot{V}_q^{\ (k)} \right]$$

$$\dot{V}_3^{\ (2)} = \frac{1}{\dot{Y}_{33}} \cdot \left[\left(\frac{\dot{S}_3^{\ (2)}}{\dot{V}_3^{\ (1)}} \right)^* - \sum_{q=1}^{2} \dot{Y}_{3q} \cdot \dot{V}_q^{\ (2)} - \sum_{q=4}^{3} \dot{Y}_{3q} \cdot \dot{V}_q^{\ (1)} \right]$$

$$\dot{V}_3^{\ (2)} = \frac{1}{\dot{Y}_{33}} \cdot \left[\left(\frac{\dot{S}_3^{\ (2)}}{\dot{V}_3^{\ (1)}} \right)^* - \dot{Y}_{31} \cdot \dot{V}_1^{\ (2)} - \dot{Y}_{32} \cdot \dot{V}_2^{\ (2)} \right]$$

$$\dot{V}_3^{\ (2)} = \frac{1}{4{,}5454\angle-90} \cdot \left[\left(\frac{-0{,}24 - j0{,}0123}{0.95\angle-3{,}7079} \right)^* - 0 \cdot (1\angle 0) - (4{,}5454\angle\ 90) \cdot (0{,}9530\angle-2{,}6995) \right]$$

$$\dot{V}_3^{\ (2)} = 0{,}9508\angle-6{,}0471$$

Por lo tanto:

$$\dot{V}_3^{\ (2)} = 0{,}95\angle-6{,}0471 \ \ (p.u)$$

$\dot{V}_2^{(2)} = 0{,}9530\angle -2{,}6995\ (p.u)$ $\dot{V}_3^{(2)} = 0{,}95\angle -6{,}0471\ (p.u)$

Para K = 2, nos queda:

$$\dot{V}_p^{(k+1)} = \frac{1}{\dot{Y}_{pp}} \cdot \left[\left(\frac{\dot{S}_p}{\dot{V}_p^{(k)}} \right)^* - \sum_{q=1}^{p-1} \dot{Y}_{pq} \cdot \dot{V}_q^{(k+1)} - \sum_{q=p+1}^{n} \dot{Y}_{pq} \cdot \dot{V}_q^{(k)} \right]$$

$$\dot{V}_2^{(3)} = \frac{1}{\dot{Y}_{22}} \cdot \left[\left(\frac{\dot{S}_2}{\dot{V}_2^{(2)}} \right)^* - \sum_{q=1}^{1} \dot{Y}_{2q} \cdot \dot{V}_q^{(3)} - \sum_{q=3}^{3} \dot{Y}_{2q} \cdot \dot{V}_q^{(2)} \right]$$

$$\dot{V}_2^{(3)} = \frac{1}{\dot{Y}_{22}} \cdot \left[\left(\frac{\dot{S}_2}{\dot{V}_2^{(2)}} \right)^* - \dot{Y}_{21} \cdot \dot{V}_1^{(3)} - \dot{Y}_{23} \cdot \dot{V}_3^{(2)} \right]$$

$$\dot{V}_2^{(3)} = \frac{1}{7{,}1109\angle -80{,}1873} \cdot \left[\left(\frac{-0{,}09 - j0{,}0435}{(0{,}9530\angle -2{,}6995)} \right)^* - (2{,}7435\angle\ 116{,}2136) \cdot (1\angle 0) - (4{,}5454\angle\ 90) \cdot (0{,}95\angle -6{,}0471) \right]$$

$\dot{V}_2^{(3)} = 0{,}9476\angle -4{,}1509\ (p.u)$

$$Q_p^{(k+1)} = -Im \left[\left(\dot{V}_p^{(k)} \right)^* \cdot \left(\sum_{q=1}^{p-1} \dot{Y}_{pq} \cdot \dot{V}_q^{(k+1)} + \sum_{q=p}^{n} \dot{Y}_{pq} \cdot \dot{V}_q^{(k)} \right) \right]$$

$$Q_3^{(3)} = -Im \left[\left(\dot{V}_3^{(2)} \right)^* \cdot \left(\sum_{q=1}^{2} \dot{Y}_{3q} \cdot \dot{V}_q^{(3)} + \sum_{q=3}^{3} \dot{Y}_{3q} \cdot \dot{V}_q^{(2)} \right) \right]$$

$$Q_3^{(3)} = -Im \left[\left(\dot{V}_3^{(2)} \right)^* \cdot \left(\dot{Y}_{31} \cdot \dot{V}_1^{(3)} + \dot{Y}_{32} \cdot \dot{V}_2^{(3)} + \dot{Y}_{33} \cdot \dot{V}_3^{(2)} \right) \right]$$

$$Q_3^{(3)} = -Im[(0{,}95\angle -6{,}0471)^* \cdot (0 \cdot (1\angle 0) + (4{,}5454\angle\ 90°) \cdot (0{,}9476\angle -4{,}1509) + (4{,}5454\angle -90) \cdot (0{,}95\angle -6{,}0471))]$$

$Q_3^{(3)} = 0{,}0126\ (p.u)$

$$S_3^{(k+1)} = -0{,}24 + jQ_3^{(k+1)}$$
$$Q_{BC}^{(k+1)} = Q_3^{(k+1)} + 0{,}18\ (p.u)$$

$Q_{BC}^{(3)} = Q_3^{(3)} + 0{,}18\ (p.u) = 0{,}1926\ (p.u)$

$S_3^{(3)} = -0{,}24 + jQ_3^{(3)} = -0{,}24 + j0{,}0126\ (p.u) = 0{,}2403\angle 176{,}9947\ \ (p.u)$

$$\dot{V}_p{}^{(k+1)} = \frac{1}{\dot{Y}_{pp}} \cdot \left[\left(\frac{\dot{S}_p{}^{(k+1)}}{\dot{V}_p{}^{(k)}} \right)^* - \sum_{q=1}^{p-1} \dot{Y}_{pq} \cdot \dot{V}_q{}^{(k+1)} - \sum_{q=p+1}^{n} \dot{Y}_{pq} \cdot \dot{V}_q{}^{(k)} \right]$$

$$\dot{V}_3{}^{(3)} = \frac{1}{\dot{Y}_{33}} \cdot \left[\left(\frac{\dot{S}_3{}^{(3)}}{\dot{V}_3{}^{(2)}} \right)^* - \sum_{q=1}^{2} \dot{Y}_{3q} \cdot \dot{V}_q{}^{(3)} - \sum_{q=4}^{3} \dot{Y}_{3q} \cdot \dot{V}_q{}^{(2)} \right]$$

$$\dot{V}_3{}^{(3)} = \frac{1}{\dot{Y}_{33}} \cdot \left[\left(\frac{\dot{S}_3{}^{(3)}}{\dot{V}_3{}^{(2)}} \right)^* - \dot{Y}_{31} \cdot \dot{V}_1{}^{(3)} - \dot{Y}_{32} \cdot \dot{V}_2{}^{(3)} \right]$$

$$\dot{V}_3{}^{(3)} = \frac{1}{4{,}5454\angle -90} \cdot \left[\left(\frac{-0{,}24 + j0{,}0126}{0{,}95\angle -6{,}0471} \right)^* - 0 \cdot (1\angle 0) - (4{,}5454\angle\, 90) \cdot (0{,}9476\angle -4{,}1509) \right]$$

$$\dot{V}_3{}^{(3)} = 0{,}9503\angle -7{,}5078$$

Por lo tanto:

$$\dot{V}_3{}^{(3)} = 0.95\angle -7{,}5078 \ \ (p.u)$$

$\dot{V}_2^{(3)} = 0{,}9476\angle -4{,}1509\ (p.u)$ $\dot{V}_3^{(3)} = 0{,}95\angle -7{,}5078\ (p.u)$

Para K = 3, nos queda:

$$\dot{V}_p^{(k+1)} = \frac{1}{\dot{Y}_{pp}} \cdot \left[\left(\frac{\dot{S}_p}{\dot{V}_p^{(k)}}\right)^* - \sum_{q=1}^{p-1} \dot{Y}_{pq} \cdot \dot{V}_q^{(k+1)} - \sum_{q=p+1}^{n} \dot{Y}_{pq} \cdot \dot{V}_q^{(k)}\right]$$

$$\dot{V}_2^{(4)} = \frac{1}{\dot{Y}_{22}} \cdot \left[\left(\frac{\dot{S}_2}{\dot{V}_2^{(3)}}\right)^* - \sum_{q=1}^{1} \dot{Y}_{2q} \cdot \dot{V}_q^{(4)} - \sum_{q=3}^{3} \dot{Y}_{2q} \cdot \dot{V}_q^{(3)}\right]$$

$$\dot{V}_2^{(4)} = \frac{1}{\dot{Y}_{22}} \cdot \left[\left(\frac{\dot{S}_2}{\dot{V}_2^{(3)}}\right)^* - \dot{Y}_{21} \cdot \dot{V}_1^{(4)} - \dot{Y}_{23} \cdot \dot{V}_3^{(3)}\right]$$

$$\dot{V}_2^{(4)} = \frac{1}{7{,}1109\angle -80{,}1873} \cdot \left[\left(\frac{-0{,}09 - j0{,}0435}{(0{,}9476\angle -4{,}1509)}\right)^* - (2{,}7435\angle\ 116{,}2136) \cdot (1\angle 0) - (4{,}5454\angle\ 90) \cdot (0{,}95\angle -7{,}5078)\right]$$

$\dot{V}_2^{(4)} = 0{,}9440\angle -5{,}0596\ (p.u)$

$$Q_p^{(k+1)} = -Im\left[\left(\dot{V}_p^{(k)}\right)^* \cdot \left(\sum_{q=1}^{p-1} \dot{Y}_{pq} \cdot \dot{V}_q^{(k+1)} + \sum_{q=p}^{n} \dot{Y}_{pq} \cdot \dot{V}_q^{(k)}\right)\right]$$

$$Q_3^{(4)} = -Im\left[\left(\dot{V}_3^{(3)}\right)^* \cdot \left(\sum_{q=1}^{2} \dot{Y}_{3q} \cdot \dot{V}_q^{(4)} + \sum_{q=3}^{3} \dot{Y}_{3q} \cdot \dot{V}_q^{(3)}\right)\right]$$

$$Q_3^{(4)} = -Im\left[\left(\dot{V}_3^{(3)}\right)^* \cdot \left(\dot{Y}_{31} \cdot \dot{V}_1^{(4)} + \dot{Y}_{32} \cdot \dot{V}_2^{(4)} + \dot{Y}_{33} \cdot \dot{V}_3^{(3)}\right)\right]$$

$$Q_3^{(4)} = -Im[(0{,}95\angle -7{,}5078)^* \cdot (0 \cdot (1\angle 0) + (4{,}5454\angle\ 90°) \cdot (0{,}9440\angle -5{,}0596) + (4{,}5454\angle -90) \cdot (0{,}95\angle -7{,}5078))]$$

$Q_3^{(4)} = 0{,}0296\ (p.u)$

$$S_3^{(k+1)} = -0{,}24 + jQ_3^{(k+1)}$$
$$Q_{BC}^{(k+1)} = Q_3^{(k+1)} + 0{,}18\ (p.u)$$

$Q_{BC}^{(4)} = Q_3^{(4)} + 0{,}18\ (p.u) = 0{,}2096\ (p.u)$

$S_3^{(4)} = -0{,}24 + jQ_3^{(4)} = -0{,}24 + j0{,}0296\ (p.u) = 0{,}2418\angle 172{,}9690\ \ (p.u)$

$$\dot{V}_p^{\ (k+1)} = \frac{1}{\dot{Y}_{pp}} \cdot \left[\left(\frac{\dot{S}_p^{\ (k+1)}}{\dot{V}_p^{\ (k)}} \right)^* - \sum_{q=1}^{p-1} \dot{Y}_{pq} \cdot \dot{V}_q^{\ (k+1)} - \sum_{q=p+1}^{n} \dot{Y}_{pq} \cdot \dot{V}_q^{\ (k)} \right]$$

$$\dot{V}_3^{\ (4)} = \frac{1}{\dot{Y}_{33}} \cdot \left[\left(\frac{\dot{S}_3^{\ (4)}}{\dot{V}_3^{\ (3)}} \right)^* - \sum_{q=1}^{2} \dot{Y}_{3q} \cdot \dot{V}_q^{\ (4)} - \sum_{q=4}^{3} \dot{Y}_{3q} \cdot \dot{V}_q^{\ (3)} \right]$$

$$\dot{V}_3^{\ (4)} = \frac{1}{\dot{Y}_{33}} \cdot \left[\left(\frac{\dot{S}_3^{\ (4)}}{\dot{V}_3^{\ (3)}} \right)^* - \dot{Y}_{31} \cdot \dot{V}_1^{\ (4)} - \dot{Y}_{32} \cdot \dot{V}_2^{\ (4)} \right]$$

$$\dot{V}_3^{\ (4)} = \frac{1}{4{,}5454\angle -90} \cdot \left[\left(\frac{-0{,}24 + j0{,}0296}{0{,}95\angle -7{,}5078} \right)^* - 0 \cdot (1\angle 0) - (4{,}5454\angle\, 90) \cdot (0{,}9440\angle -5{,}0596) \right]$$

$$\dot{V}_3^{\ (4)} = 0{,}9501\angle -8{,}4278$$

Por lo tanto:

$$\dot{V}_3^{\ (4)} = 0.95\angle -8{,}4278 \ \ (p.u)$$

$\dot{V}_2^{(4)} = 0{,}9440\angle -5{,}0596\ (p.u)$ $\dot{V}_3^{(4)} = 0{,}95\angle -8{,}4278\ (p.u)$

Para K = 4, nos queda:

$$\dot{V}_p^{(k+1)} = \frac{1}{\dot{Y}_{pp}} \cdot \left[\left(\frac{\dot{S}_p}{\dot{V}_p^{(k)}} \right)^* - \sum_{q=1}^{p-1} \dot{Y}_{pq} \cdot \dot{V}_q^{(k+1)} - \sum_{q=p+1}^{n} \dot{Y}_{pq} \cdot \dot{V}_q^{(k)} \right]$$

$$\dot{V}_2^{(5)} = \frac{1}{\dot{Y}_{22}} \cdot \left[\left(\frac{\dot{S}_2}{\dot{V}_2^{(4)}} \right)^* - \sum_{q=1}^{1} \dot{Y}_{2q} \cdot \dot{V}_q^{(5)} - \sum_{q=3}^{3} \dot{Y}_{2q} \cdot \dot{V}_q^{(4)} \right]$$

$$\dot{V}_2^{(5)} = \frac{1}{\dot{Y}_{22}} \cdot \left[\left(\frac{\dot{S}_2}{\dot{V}_2^{(4)}} \right)^* - \dot{Y}_{21} \cdot \dot{V}_1^{(5)} - \dot{Y}_{23} \cdot \dot{V}_3^{(4)} \right]$$

$$\dot{V}_2^{(5)} = \frac{1}{7{,}1109\angle -80{,}1873} \cdot \left[\left(\frac{-0{,}09 - j0{,}0435}{(0{,}9440\angle -5{,}0596)} \right)^* - (2{,}7435\angle\ 116{,}2136) \cdot (1\angle 0) - (4{,}5454\angle\ 90) \cdot (0{,}95\angle -8{,}4278) \right]$$

$\dot{V}_2^{(5)} = 0{,}9417\angle -5{,}6329\ (p.u)$

$$Q_p^{(k+1)} = -Im \left[\left(\dot{V}_p^{(k)} \right)^* \cdot \left(\sum_{q=1}^{p-1} \dot{Y}_{pq} \cdot \dot{V}_q^{(k+1)} + \sum_{q=p}^{n} \dot{Y}_{pq} \cdot \dot{V}_q^{(k)} \right) \right]$$

$$Q_3^{(5)} = -Im \left[\left(\dot{V}_3^{(4)} \right)^* \cdot \left(\sum_{q=1}^{2} \dot{Y}_{3q} \cdot \dot{V}_q^{(5)} + \sum_{q=3}^{3} \dot{Y}_{3q} \cdot \dot{V}_q^{(4)} \right) \right]$$

$$Q_3^{(5)} = -Im \left[\left(\dot{V}_3^{(4)} \right)^* \cdot \left(\dot{Y}_{31} \cdot \dot{V}_1^{(5)} + \dot{Y}_{32} \cdot \dot{V}_2^{(5)} + \dot{Y}_{33} \cdot \dot{V}_3^{(4)} \right) \right]$$

$$Q_3^{(5)} = -Im[(0{,}95\angle -8{,}4278)^* \cdot (0 \cdot (1\angle 0) + (4{,}5454\angle\ 90°) \cdot (0{,}9417\angle -5{,}6329) + (4{,}5454\angle -90) \cdot (0{,}95\angle -8{,}4278))]$$

$Q_3^{(5)} = 0{,}0407\ (p.u)$

$$S_3^{(k+1)} = -0{,}24 + jQ_3^{(k+1)}$$
$$Q_{BC}^{(k+1)} = Q_3^{(k+1)} + 0{,}18\ (p.u)$$

$Q_{BC}^{(5)} = Q_3^{(5)} + 0{,}18\ (p.u) = 0{,}2207\ (p.u)$

$S_3^{(5)} = -0{,}24 + jQ_3^{(5)} = -0{,}24 + j0{,}0407\ (p.u) = 0{,}2434\angle 170{,}3751\ \ (p.u)$

$$\dot{V}_p^{\ (k+1)} = \frac{1}{\dot{Y}_{pp}} \cdot \left[\left(\frac{\dot{S}_p^{\ (k+1)}}{\dot{V}_p^{\ (k)}} \right)^* - \sum_{q=1}^{p-1} \dot{Y}_{pq} \cdot \dot{V}_q^{\ (k+1)} - \sum_{q=p+1}^{n} \dot{Y}_{pq} \cdot \dot{V}_q^{\ (k)} \right]$$

$$\dot{V}_3^{\ (5)} = \frac{1}{\dot{Y}_{33}} \cdot \left[\left(\frac{\dot{S}_3^{\ (5)}}{\dot{V}_3^{\ (4)}} \right)^* - \sum_{q=1}^{2} \dot{Y}_{3q} \cdot \dot{V}_q^{\ (5)} - \sum_{q=4}^{3} \dot{Y}_{3q} \cdot \dot{V}_q^{\ (4)} \right]$$

$$\dot{V}_3^{\ (5)} = \frac{1}{\dot{Y}_{33}} \cdot \left[\left(\frac{\dot{S}_3^{\ (5)}}{\dot{V}_3^{\ (4)}} \right)^* - \dot{Y}_{31} \cdot \dot{V}_1^{\ (5)} - \dot{Y}_{32} \cdot \dot{V}_2^{\ (5)} \right]$$

$$\dot{V}_3^{\ (5)} = \frac{1}{4{,}5454\angle -90} \cdot \left[\left(\frac{-0{,}24 + j0{,}0407}{0{,}95\angle -8{,}4278} \right)^* - 0 \cdot (1\angle 0) - (4{,}5454\angle\ 90) \cdot (0{,}9417\angle -5{,}6329) \right]$$

$$\dot{V}_3^{\ (5)} = 0{,}9501\angle -9{,}0105$$

Por lo tanto:

$$\dot{V}_3^{\ (5)} = 0.95\angle -9{,}0105 \ \ (p.u)$$

$\dot{V}_2{}^{(5)} = 0{,}9417\angle -5{,}6329\ (p.u)$ $\dot{V}_3{}^{(5)} = 0{,}95\angle -9{,}0105\ (p.u)$

Para K = 5, nos queda:

$$\dot{V}_p{}^{(k+1)} = \frac{1}{\dot{Y}_{pp}} \cdot \left[\left(\frac{\dot{S}_p}{\dot{V}_p{}^{(k)}} \right)^* - \sum_{q=1}^{p-1} \dot{Y}_{pq} \cdot \dot{V}_q{}^{(k+1)} - \sum_{q=p+1}^{n} \dot{Y}_{pq} \cdot \dot{V}_q{}^{(k)} \right]$$

$$\dot{V}_2{}^{(6)} = \frac{1}{\dot{Y}_{22}} \cdot \left[\left(\frac{\dot{S}_2}{\dot{V}_2{}^{(5)}} \right)^* - \sum_{q=1}^{1} \dot{Y}_{2q} \cdot \dot{V}_q{}^{(6)} - \sum_{q=3}^{3} \dot{Y}_{2q} \cdot \dot{V}_q{}^{(5)} \right]$$

$$\dot{V}_2{}^{(6)} = \frac{1}{\dot{Y}_{22}} \cdot \left[\left(\frac{\dot{S}_2}{\dot{V}_2{}^{(5)}} \right)^* - \dot{Y}_{21} \cdot \dot{V}_1{}^{(6)} - \dot{Y}_{23} \cdot \dot{V}_3{}^{(5)} \right]$$

$$\dot{V}_2{}^{(6)} = \frac{1}{7{,}1109\angle -80{,}1873} \cdot \left[\left(\frac{-0{,}09 - j0{,}0435}{(0{,}9417\angle -5{,}6329)} \right)^* - (2{,}7435\angle\, 116{,}2136) \cdot (1\angle 0) - (4{,}5454\angle\, 90) \cdot (0{,}95\angle -9{,}0105) \right]$$

$\dot{V}_2{}^{(6)} = 0{,}9402\angle -5{,}9963\ (p.u)$

$$Q_p{}^{(k+1)} = -Im\left[\left(\dot{V}_p{}^{(k)} \right)^* \cdot \left(\sum_{q=1}^{p-1} \dot{Y}_{pq} \cdot \dot{V}_q{}^{(k+1)} + \sum_{q=p}^{n} \dot{Y}_{pq} \cdot \dot{V}_q{}^{(k)} \right) \right]$$

$$Q_3{}^{(6)} = -Im\left[\left(\dot{V}_3{}^{(5)} \right)^* \cdot \left(\sum_{q=1}^{2} \dot{Y}_{3q} \cdot \dot{V}_q{}^{(6)} + \sum_{q=3}^{3} \dot{Y}_{3q} \cdot \dot{V}_q{}^{(5)} \right) \right]$$

$$Q_3{}^{(6)} = -Im\left[\left(\dot{V}_3{}^{(5)} \right)^* \cdot \left(\dot{Y}_{31} \cdot \dot{V}_1{}^{(6)} + \dot{Y}_{32} \cdot \dot{V}_2{}^{(6)} + \dot{Y}_{33} \cdot \dot{V}_3{}^{(5)} \right) \right]$$

$$Q_3{}^{(6)} = -Im[(0{,}95\angle -9{,}0105)^* \cdot (0 \cdot (1\angle 0) + (4{,}5454\angle\, 90°) \cdot (0{,}9402\angle -5{,}9963) + (4{,}5454\angle -90) \cdot (0{,}95\angle -9{,}0105))]$$

$Q_3{}^{(6)} = 0{,}0479\ (p.u)$

$$S_3{}^{(k+1)} = -0{,}24 + jQ_3{}^{(k+1)}$$
$$Q_{BC}{}^{(k+1)} = Q_3{}^{(k+1)} + 0{,}18\ (p.u)$$

$Q_{BC}{}^{(6)} = Q_3{}^{(6)} + 0{,}18\ (p.u) = 0{,}2279\ (p.u)$

$S_3{}^{(6)} = -0{,}24 + jQ_3{}^{(6)} = -0{,}24 + j0{,}0479\ (p.u) = 0{,}2447\angle 168{,}7130\ \ (p.u)$

$$\dot{V}_p^{\ (k+1)} = \frac{1}{\dot{Y}_{pp}} \cdot \left[\left(\frac{\dot{S}_p^{\ (k+1)}}{\dot{V}_p^{\ (k)}} \right)^* - \sum_{q=1}^{p-1} \dot{Y}_{pq} \cdot \dot{V}_q^{\ (k+1)} - \sum_{q=p+1}^{n} \dot{Y}_{pq} \cdot \dot{V}_q^{\ (k)} \right]$$

$$\dot{V}_3^{\ (6)} = \frac{1}{\dot{Y}_{33}} \cdot \left[\left(\frac{\dot{S}_3^{\ (6)}}{\dot{V}_3^{\ (5)}} \right)^* - \sum_{q=1}^{2} \dot{Y}_{3q} \cdot \dot{V}_q^{\ (6)} - \sum_{q=4}^{3} \dot{Y}_{3q} \cdot \dot{V}_q^{\ (5)} \right]$$

$$\dot{V}_3^{\ (6)} = \frac{1}{\dot{Y}_{33}} \cdot \left[\left(\frac{\dot{S}_3^{\ (6)}}{\dot{V}_3^{\ (5)}} \right)^* - \dot{Y}_{31} \cdot \dot{V}_1^{\ (6)} - \dot{Y}_{32} \cdot \dot{V}_2^{\ (6)} \right]$$

$$\dot{V}_3^{\ (6)} = \frac{1}{4{,}5454\angle-90} \cdot \left[\left(\frac{-0{,}24 + j0{,}0479}{0{,}95\angle-9{,}0105} \right)^* - 0 \cdot (1\angle 0) - (4{,}5454\angle\, 90) \cdot (0{,}9402\angle-5{,}9963) \right]$$

$$\dot{V}_3^{\ (6)} = 0{,}9500\angle-9{,}3808$$

Por lo tanto:

$$\dot{V}_3^{\ (6)} = 0.95\angle-9{,}3808 \ \ (p.u)$$

$\dot{V}_2^{\ (6)} = 0{,}9402\angle - 5{,}9963\ (p.u)$ $\dot{V}_3^{\ (6)} = 0{,}95\angle - 9{,}3808\ (p.u)$

Para K = 6, nos queda:

$$\dot{V}_p^{\ (k+1)} = \frac{1}{\dot{Y}_{pp}} \cdot \left[\left(\frac{\dot{S}_p}{\dot{V}_p^{\ (k)}} \right)^* - \sum_{q=1}^{p-1} \dot{Y}_{pq} \cdot \dot{V}_q^{\ (k+1)} - \sum_{q=p+1}^{n} \dot{Y}_{pq} \cdot \dot{V}_q^{\ (k)} \right]$$

$$\dot{V}_2^{\ (7)} = \frac{1}{\dot{Y}_{22}} \cdot \left[\left(\frac{\dot{S}_2}{\dot{V}_2^{\ (6)}} \right)^* - \sum_{q=1}^{1} \dot{Y}_{2q} \cdot \dot{V}_q^{\ (7)} - \sum_{q=3}^{3} \dot{Y}_{2q} \cdot \dot{V}_q^{\ (6)} \right]$$

$$\dot{V}_2^{\ (7)} = \frac{1}{\dot{Y}_{22}} \cdot \left[\left(\frac{\dot{S}_2}{\dot{V}_2^{\ (6)}} \right)^* - \dot{Y}_{21} \cdot \dot{V}_1^{\ (7)} - \dot{Y}_{23} \cdot \dot{V}_3^{\ (6)} \right]$$

$$\dot{V}_2^{\ (7)} = \frac{1}{7{,}1109\angle - 80{,}1873} \cdot \left[\left(\frac{-0{,}09 - j0{,}0435}{(0{,}9402\angle - 5{,}9963)} \right)^* - (2{,}7435\angle\ 116{,}2136) \cdot (1\angle 0) - (4{,}5454\angle\ 90) \cdot (0{,}95\angle - 9{,}3808) \right]$$

$\dot{V}_2^{\ (7)} = 0{,}9392\angle - 6{,}2274\ (p.u)$

$$Q_p^{\ (k+1)} = -Im\left[\left(\dot{V}_p^{\ (k)} \right)^* \cdot \left(\sum_{q=1}^{p-1} \dot{Y}_{pq} \cdot \dot{V}_q^{\ (k+1)} + \sum_{q=p}^{n} \dot{Y}_{pq} \cdot \dot{V}_q^{\ (k)} \right) \right]$$

$$Q_3^{\ (7)} = -Im\left[\left(\dot{V}_3^{\ (6)} \right)^* \cdot \left(\sum_{q=1}^{2} \dot{Y}_{3q} \cdot \dot{V}_q^{\ (7)} + \sum_{q=3}^{3} \dot{Y}_{3q} \cdot \dot{V}_q^{\ (6)} \right) \right]$$

$$Q_3^{\ (7)} = -Im\left[\left(\dot{V}_3^{\ (6)} \right)^* \cdot \left(\dot{Y}_{31} \cdot \dot{V}_1^{\ (7)} + \dot{Y}_{32} \cdot \dot{V}_2^{\ (7)} + \dot{Y}_{33} \cdot \dot{V}_3^{\ (6)} \right) \right]$$

$$Q_3^{\ (7)} = -Im[(0{,}95\angle - 9{,}3808)^* \cdot (0 \cdot (1\angle 0) + (4{,}5454\angle\ 90°) \cdot (0{,}9392\angle - 6{,}2274) + (4{,}5454\angle - 90) \cdot (0{,}95\angle - 9{,}3808))]$$

$Q_3^{\ (7)} = 0{,}0528\ (p.u)$

$$S_3^{\ (k+1)} = -0{,}24 + jQ_3^{\ (k+1)}$$
$$Q_{BC}^{\ (k+1)} = Q_3^{\ (k+1)} + 0{,}18\ (p.u)$$

$Q_{BC}^{\ (7)} = Q_3^{\ (7)} + 0{,}18\ (p.u) = 0{,}2328\ (p.u)$

$S_3^{\ (7)} = -0{,}24 + jQ_3^{\ (7)} = -0{,}24 + j0{,}0528\ (p.u) = 0{,}2457\angle 167{,}5925\ \ (p.u)$

$$\dot{V}_p{}^{(k+1)} = \frac{1}{\dot{Y}_{pp}} \cdot \left[\left(\frac{\dot{S}_p{}^{(k+1)}}{\dot{V}_p{}^{(k)}} \right)^* - \sum_{q=1}^{p-1} \dot{Y}_{pq} \cdot \dot{V}_q{}^{(k+1)} - \sum_{q=p+1}^{n} \dot{Y}_{pq} \cdot \dot{V}_q{}^{(k)} \right]$$

$$\dot{V}_3{}^{(7)} = \frac{1}{\dot{Y}_{33}} \cdot \left[\left(\frac{\dot{S}_3{}^{(7)}}{\dot{V}_3{}^{(6)}} \right)^* - \sum_{q=1}^{2} \dot{Y}_{3q} \cdot \dot{V}_q{}^{(7)} - \sum_{q=4}^{3} \dot{Y}_{3q} \cdot \dot{V}_q{}^{(6)} \right]$$

$$\dot{V}_3{}^{(7)} = \frac{1}{\dot{Y}_{33}} \cdot \left[\left(\frac{\dot{S}_3{}^{(7)}}{\dot{V}_3{}^{(6)}} \right)^* - \dot{Y}_{31} \cdot \dot{V}_1{}^{(7)} - \dot{Y}_{32} \cdot \dot{V}_2{}^{(7)} \right]$$

$$\dot{V}_3{}^{(7)} = \frac{1}{4{,}5454\angle-90} \cdot \left[\left(\frac{-0{,}24 + j0{,}0528}{0{,}95\angle-9{,}3808} \right)^* - 0 \cdot (1\angle 0) - (4{,}5454\angle\, 90) \cdot (0{,}9392\angle-6{,}2274) \right]$$

$$\dot{V}_3{}^{(7)} = 0{,}9500\angle-9{,}6169$$

Por lo tanto:

$$\dot{V}_3{}^{(7)} = 0.95\angle-9{,}6169 \ \ (p.u)$$

$\dot{V}_2{}^{(7)} = 0,9392\angle -6,2274\ (p.u)$ $\dot{V}_3{}^{(7)} = 0,95\angle -9,6169\ (p.u)$

Para K = 7, nos queda:

$$\dot{V}_p{}^{(k+1)} = \frac{1}{\dot{Y}_{pp}} \cdot \left[\left(\frac{\dot{S}_p}{\dot{V}_p{}^{(k)}}\right)^* - \sum_{q=1}^{p-1} \dot{Y}_{pq} \cdot \dot{V}_q{}^{(k+1)} - \sum_{q=p+1}^{n} \dot{Y}_{pq} \cdot \dot{V}_q{}^{(k)}\right]$$

$$\dot{V}_2{}^{(8)} = \frac{1}{\dot{Y}_{22}} \cdot \left[\left(\frac{\dot{S}_2}{\dot{V}_2{}^{(7)}}\right)^* - \sum_{q=1}^{1} \dot{Y}_{2q} \cdot \dot{V}_q{}^{(8)} - \sum_{q=3}^{3} \dot{Y}_{2q} \cdot \dot{V}_q{}^{(7)}\right]$$

$$\dot{V}_2{}^{(8)} = \frac{1}{\dot{Y}_{22}} \cdot \left[\left(\frac{\dot{S}_2}{\dot{V}_2{}^{(7)}}\right)^* - \dot{Y}_{21} \cdot \dot{V}_1{}^{(8)} - \dot{Y}_{23} \cdot \dot{V}_3{}^{(7)}\right]$$

$$\dot{V}_2{}^{(8)} = \frac{1}{7,1109\angle -80,1873} \cdot \left[\left(\frac{-0,09 - j0,0435}{(0,9392\angle -6,2274)}\right)^* - (2,7435\angle\ 116,2136) \cdot (1\angle 0) - (4,5454\angle\ 90) \cdot (0,95\angle -9,6169)\right]$$

$\dot{V}_2{}^{(8)} = 0,9386\angle -6,3748\ (p.u)$

$$Q_p{}^{(k+1)} = -Im\left[\left(\dot{V}_p{}^{(k)}\right)^* \cdot \left(\sum_{q=1}^{p-1} \dot{Y}_{pq} \cdot \dot{V}_q{}^{(k+1)} + \sum_{q=p}^{n} \dot{Y}_{pq} \cdot \dot{V}_q{}^{(k)}\right)\right]$$

$$Q_3{}^{(8)} = -Im\left[\left(\dot{V}_3{}^{(7)}\right)^* \cdot \left(\sum_{q=1}^{2} \dot{Y}_{3q} \cdot \dot{V}_q{}^{(8)} + \sum_{q=3}^{3} \dot{Y}_{3q} \cdot \dot{V}_q{}^{(7)}\right)\right]$$

$$Q_3{}^{(8)} = -Im\left[\left(\dot{V}_3{}^{(7)}\right)^* \cdot \left(\dot{Y}_{31} \cdot \dot{V}_1{}^{(8)} + \dot{Y}_{32} \cdot \dot{V}_2{}^{(8)} + \dot{Y}_{33} \cdot \dot{V}_3{}^{(7)}\right)\right]$$

$$Q_3{}^{(8)} = -Im[(0,95\angle -9,6169)^* \cdot (0 \cdot (1\angle 0) + (4,5454\angle\ 90°) \cdot (0,9386\angle -6,3748) + (4,5454\angle -90) \cdot (0,95\angle -9,6169))]$$

$Q_3{}^{(8)} = 0,0557\ (p.u)$

$$S_3{}^{(k+1)} = -0,24 + jQ_3{}^{(k+1)}$$
$$Q_{BC}{}^{(k+1)} = Q_3{}^{(k+1)} + 0,18\ (p.u)$$

$Q_{BC}{}^{(8)} = Q_3{}^{(8)} + 0,18\ (p.u) = 0,2357\ (p.u)$

$S_3{}^{(8)} = -0,24 + jQ_3{}^{(8)} = -0,24 + j0,0557\ (p.u) = 0,2463\angle 166,9339\ \ (p.u)$

$$\dot{V}_p{}^{(k+1)} = \frac{1}{\dot{Y}_{pp}} \cdot \left[\left(\frac{\dot{S}_p{}^{(k+1)}}{\dot{V}_p{}^{(k)}} \right)^* - \sum_{q=1}^{p-1} \dot{Y}_{pq} \cdot \dot{V}_q{}^{(k+1)} - \sum_{q=p+1}^{n} \dot{Y}_{pq} \cdot \dot{V}_q{}^{(k)} \right]$$

$$\dot{V}_3{}^{(8)} = \frac{1}{\dot{Y}_{33}} \cdot \left[\left(\frac{\dot{S}_3{}^{(8)}}{\dot{V}_3{}^{(7)}} \right)^* - \sum_{q=1}^{2} \dot{Y}_{3q} \cdot \dot{V}_q{}^{(8)} - \sum_{q=4}^{3} \dot{Y}_{3q} \cdot \dot{V}_q{}^{(7)} \right]$$

$$\dot{V}_3{}^{(8)} = \frac{1}{\dot{Y}_{33}} \cdot \left[\left(\frac{\dot{S}_3{}^{(8)}}{\dot{V}_3{}^{(7)}} \right)^* - \dot{Y}_{31} \cdot \dot{V}_1{}^{(8)} - \dot{Y}_{32} \cdot \dot{V}_2{}^{(8)} \right]$$

$$\dot{V}_3{}^{(8)} = \frac{1}{4{,}5454\angle-90} \cdot \left[\left(\frac{-0{,}24 + j0{,}0557}{0{,}95\angle-9{,}6169} \right)^* - 0 \cdot (1\angle 0) - (4{,}5454\angle\ 90) \cdot (0{,}9386\angle-6{,}3748) \right]$$

$$\dot{V}_3{}^{(8)} = 0{,}9500\angle-9{,}7675$$

Por lo tanto:

$$\dot{V}_3{}^{(8)} = 0.95\angle-9{,}7675 \ \ (p.u)$$

$\dot{V}_2{}^{(8)} = 0{,}9386\angle -6{,}3748\ (p.u)$ $\qquad$ $\dot{V}_3{}^{(8)} = 0{,}95\angle -9{,}7675\ (p.u)$

Para K = 8, nos queda:

$$\dot{V}_p{}^{(k+1)} = \frac{1}{\dot{Y}_{pp}} \cdot \left[\left(\frac{\dot{S}_p}{\dot{V}_p{}^{(k)}} \right)^* - \sum_{q=1}^{p-1} \dot{Y}_{pq} \cdot \dot{V}_q{}^{(k+1)} - \sum_{q=p+1}^{n} \dot{Y}_{pq} \cdot \dot{V}_q{}^{(k)} \right]$$

$$\dot{V}_2{}^{(9)} = \frac{1}{\dot{Y}_{22}} \cdot \left[\left(\frac{\dot{S}_2}{\dot{V}_2{}^{(8)}} \right)^* - \sum_{q=1}^{1} \dot{Y}_{2q} \cdot \dot{V}_q{}^{(9)} - \sum_{q=3}^{3} \dot{Y}_{2q} \cdot \dot{V}_q{}^{(8)} \right]$$

$$\dot{V}_2{}^{(9)} = \frac{1}{\dot{Y}_{22}} \cdot \left[\left(\frac{\dot{S}_2}{\dot{V}_2{}^{(8)}} \right)^* - \dot{Y}_{21} \cdot \dot{V}_1{}^{(9)} - \dot{Y}_{23} \cdot \dot{V}_3{}^{(8)} \right]$$

$$\dot{V}_2{}^{(9)} = \frac{1}{7{,}1109\angle -80{,}1873} \cdot \left[\left(\frac{-0{,}09 - j0{,}0435}{(0{,}9386\angle -6{,}3748)} \right)^* - (2{,}7435\angle\ 116{,}2136) \cdot (1\angle 0) - (4{,}5454\angle\ 90) \cdot (0{,}95\angle -9{,}7675) \right]$$

$$\dot{V}_2{}^{(9)} = 0{,}9382\angle -6{,}4689\ (p.u)$$

$$Q_p{}^{(k+1)} = -Im \left[\left(\dot{V}_p{}^{(k)} \right)^* \cdot \left(\sum_{q=1}^{p-1} \dot{Y}_{pq} \cdot \dot{V}_q{}^{(k+1)} + \sum_{q=p}^{n} \dot{Y}_{pq} \cdot \dot{V}_q{}^{(k)} \right) \right]$$

$$Q_3{}^{(9)} = -Im \left[\left(\dot{V}_3{}^{(8)} \right)^* \cdot \left(\sum_{q=1}^{2} \dot{Y}_{3q} \cdot \dot{V}_q{}^{(9)} + \sum_{q=3}^{3} \dot{Y}_{3q} \cdot \dot{V}_q{}^{(8)} \right) \right]$$

$$Q_3{}^{(9)} = -Im \left[\left(\dot{V}_3{}^{(8)} \right)^* \cdot \left(\dot{Y}_{31} \cdot \dot{V}_1{}^{(9)} + \dot{Y}_{32} \cdot \dot{V}_2{}^{(9)} + \dot{Y}_{33} \cdot \dot{V}_3{}^{(8)} \right) \right]$$

$$Q_3{}^{(9)} = -Im[(0{,}95\angle -9{,}7675)^* \cdot (0 \cdot (1\angle 0) + (4{,}5454\angle\ 90°) \cdot (0{,}9382\angle -6{,}4689) + (4{,}5454\angle -90) \cdot (0{,}95\angle -9{,}7675))]$$

$$Q_3{}^{(9)} = 0{,}0577\ (p.u)$$

$$S_3{}^{(k+1)} = -0{,}24 + jQ_3{}^{(k+1)}$$
$$Q_{BC}{}^{(k+1)} = Q_3{}^{(k+1)} + 0{,}18\ (p.u)$$

$$Q_{BC}{}^{(9)} = Q_3{}^{(9)} + 0{,}18\ (p.u) = 0{,}2377\ (p.u)$$

$$S_3{}^{(9)} = -0{,}24 + jQ_3{}^{(9)} = -0{,}24 + j0{,}0577\ (p.u) = 0{,}2468\angle 166{,}4816\ \ (p.u)$$

$$\dot{V}_p^{(k+1)} = \frac{1}{\dot{Y}_{pp}} \cdot \left[\left(\frac{\dot{S}_p^{(k+1)}}{\dot{V}_p^{(k)}} \right)^* - \sum_{q=1}^{p-1} \dot{Y}_{pq} \cdot \dot{V}_q^{(k+1)} - \sum_{q=p+1}^{n} \dot{Y}_{pq} \cdot \dot{V}_q^{(k)} \right]$$

$$\dot{V}_3^{(9)} = \frac{1}{\dot{Y}_{33}} \cdot \left[\left(\frac{\dot{S}_3^{(9)}}{\dot{V}_3^{(8)}} \right)^* - \sum_{q=1}^{2} \dot{Y}_{3q} \cdot \dot{V}_q^{(9)} - \sum_{q=4}^{3} \dot{Y}_{3q} \cdot \dot{V}_q^{(8)} \right]$$

$$\dot{V}_3^{(9)} = \frac{1}{\dot{Y}_{33}} \cdot \left[\left(\frac{\dot{S}_3^{(9)}}{\dot{V}_3^{(8)}} \right)^* - \dot{Y}_{31} \cdot \dot{V}_1^{(9)} - \dot{Y}_{32} \cdot \dot{V}_2^{(9)} \right]$$

$$\dot{V}_3^{(9)} = \frac{1}{4{,}5454\angle-90} \cdot \left[\left(\frac{-0{,}24 + j0{,}0577}{0{,}95\angle-9{,}7675} \right)^* - 0 \cdot (1\angle 0) - (4{,}5454\angle\, 90) \cdot (0{,}9382\angle-6{,}4689) \right]$$

$$\dot{V}_3^{(9)} = 0{,}9500\angle-9{,}8638$$

Por lo tanto:

$$\dot{V}_3^{(9)} = 0.95\angle-9{,}8638 \;\; (p.u)$$

$\dot{V}_2{}^{(9)} = 0{,}9382\angle - 6{,}4689\ (p.u)$ $\dot{V}_3{}^{(9)} = 0{,}95\angle - 9{,}8638\ (p.u)$

Para K = 9, nos queda:

$$\dot{V}_p{}^{(k+1)} = \frac{1}{\dot{Y}_{pp}} \cdot \left[\left(\frac{\dot{S}_p}{\dot{V}_p{}^{(k)}} \right)^* - \sum_{q=1}^{p-1} \dot{Y}_{pq} \cdot \dot{V}_q{}^{(k+1)} - \sum_{q=p+1}^{n} \dot{Y}_{pq} \cdot \dot{V}_q{}^{(k)} \right]$$

$$\dot{V}_2{}^{(10)} = \frac{1}{\dot{Y}_{22}} \cdot \left[\left(\frac{\dot{S}_2}{\dot{V}_2{}^{(9)}} \right)^* - \sum_{q=1}^{1} \dot{Y}_{2q} \cdot \dot{V}_q{}^{(10)} - \sum_{q=3}^{3} \dot{Y}_{2q} \cdot \dot{V}_q{}^{(9)} \right]$$

$$\dot{V}_2{}^{(10)} = \frac{1}{\dot{Y}_{22}} \cdot \left[\left(\frac{\dot{S}_2}{\dot{V}_2{}^{(9)}} \right)^* - \dot{Y}_{21} \cdot \dot{V}_1{}^{(10)} - \dot{Y}_{23} \cdot \dot{V}_3{}^{(9)} \right]$$

$$\dot{V}_2{}^{(10)} = \frac{1}{7{,}1109\angle - 80{,}1873} \cdot \left[\left(\frac{-0{,}09 - j0{,}0435}{(0{,}9382\angle - 6{,}4689)} \right)^* - (2{,}7435\angle\ 116{,}2136) \cdot (1\angle 0) - (4{,}5454\angle\ 90) \cdot (0{,}95\angle - 9{,}8638) \right]$$

$$\dot{V}_2{}^{(10)} = 0{,}9380\angle - 6{,}5290\ (p.u)$$

$$Q_p{}^{(k+1)} = -Im \left[\left(\dot{V}_p{}^{(k)} \right)^* \cdot \left(\sum_{q=1}^{p-1} \dot{Y}_{pq} \cdot \dot{V}_q{}^{(k+1)} + \sum_{q=p}^{n} \dot{Y}_{pq} \cdot \dot{V}_q{}^{(k)} \right) \right]$$

$$Q_3{}^{(10)} = -Im \left[\left(\dot{V}_3{}^{(9)} \right)^* \cdot \left(\sum_{q=1}^{2} \dot{Y}_{3q} \cdot \dot{V}_q{}^{(10)} + \sum_{q=3}^{3} \dot{Y}_{3q} \cdot \dot{V}_q{}^{(9)} \right) \right]$$

$$Q_3{}^{(10)} = -Im \left[\left(\dot{V}_3{}^{(9)} \right)^* \cdot \left(\dot{Y}_{31} \cdot \dot{V}_1{}^{(10)} + \dot{Y}_{32} \cdot \dot{V}_2{}^{(10)} + \dot{Y}_{33} \cdot \dot{V}_3{}^{(9)} \right) \right]$$

$$Q_3{}^{(10)} = -Im[(0{,}95\angle - 9{,}8638)^* \cdot (0 \cdot (1\angle 0) + (4{,}5454\angle\ 90°) \cdot (0{,}9380\angle - 6{,}5290) + (4{,}5454\angle - 90) \cdot (0{,}95\angle - 9{,}8638))]$$

$$Q_3{}^{(10)} = 0{,}0587\ (p.u)$$

$$S_3{}^{(k+1)} = -0{,}24 + jQ_3{}^{(k+1)}$$
$$Q_{BC}{}^{(k+1)} = Q_3{}^{(k+1)} + 0{,}18\ (p.u)$$

$$Q_{BC}{}^{(10)} = Q_3{}^{(10)} + 0{,}18\ (p.u) = 0{,}2387\ (p.u)$$

$$S_3{}^{(10)} = -0{,}24 + jQ_3{}^{(10)} = -0{,}24 + j0{,}0587\ (p.u) = 0{,}2470\angle 166{,}2562\ \ (p.u)$$

$$\dot{V}_p^{(k+1)} = \frac{1}{\dot{Y}_{pp}} \cdot \left[\left(\frac{\dot{S}_p^{(k+1)}}{\dot{V}_p^{(k)}} \right)^* - \sum_{q=1}^{p-1} \dot{Y}_{pq} \cdot \dot{V}_q^{(k+1)} - \sum_{q=p+1}^{n} \dot{Y}_{pq} \cdot \dot{V}_q^{(k)} \right]$$

$$\dot{V}_3^{(10)} = \frac{1}{\dot{Y}_{33}} \cdot \left[\left(\frac{\dot{S}_3^{(10)}}{\dot{V}_3^{(9)}} \right)^* - \sum_{q=1}^{2} \dot{Y}_{3q} \cdot \dot{V}_q^{(10)} - \sum_{q=4}^{3} \dot{Y}_{3q} \cdot \dot{V}_q^{(9)} \right]$$

$$\dot{V}_3^{(10)} = \frac{1}{\dot{Y}_{33}} \cdot \left[\left(\frac{\dot{S}_3^{(10)}}{\dot{V}_3^{(9)}} \right)^* - \dot{Y}_{31} \cdot \dot{V}_1^{(10)} - \dot{Y}_{32} \cdot \dot{V}_2^{(10)} \right]$$

$$\dot{V}_3^{(10)} = \frac{1}{4{,}5454\angle -90} \cdot \left[\left(\frac{-0{,}24 + j0{,}0587}{0{,}95\angle -9{,}8638} \right)^* - 0 \cdot (1\angle 0) - (4{,}5454\angle\, 90) \cdot (0{,}9380\angle -6{,}5290) \right]$$

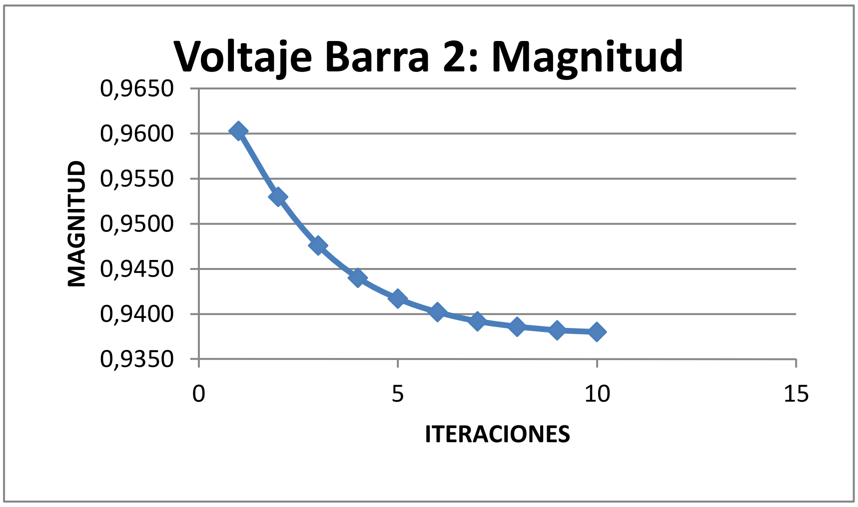
$$\dot{V}_3^{(10)} = 0{,}9500\angle -9{,}9251$$

Por lo tanto:

$$\dot{V}_3^{(10)} = 0.95\angle -9{,}9251 \;\; (p.u)$$

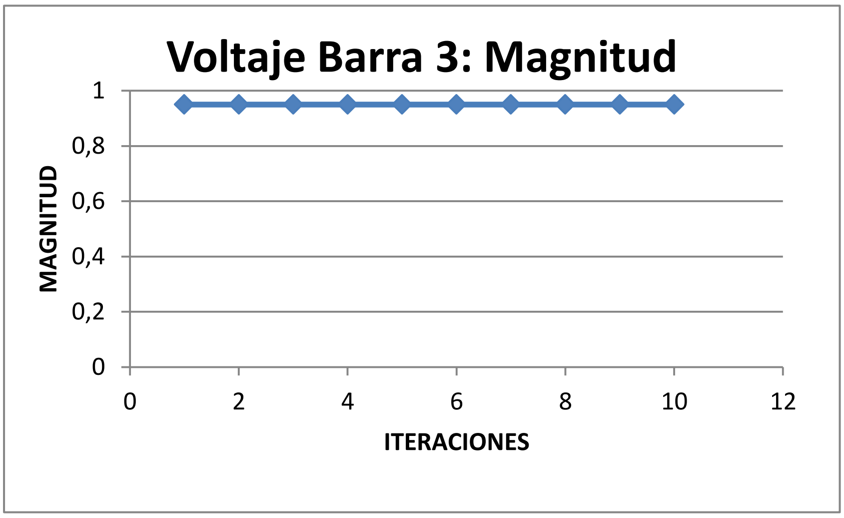
2. Graficar:
- La magnitud del voltaje en la Barra 2
- La magnitud del voltaje en la Barra 3
- El ángulo del voltaje en la Barra 2
- El ángulo del voltaje en la Barra 3
- La potencia reactiva Q_3
- La potencia reactiva Q_{BC}

1. Magnitud del voltaje en la Barra 2 (p.u.)



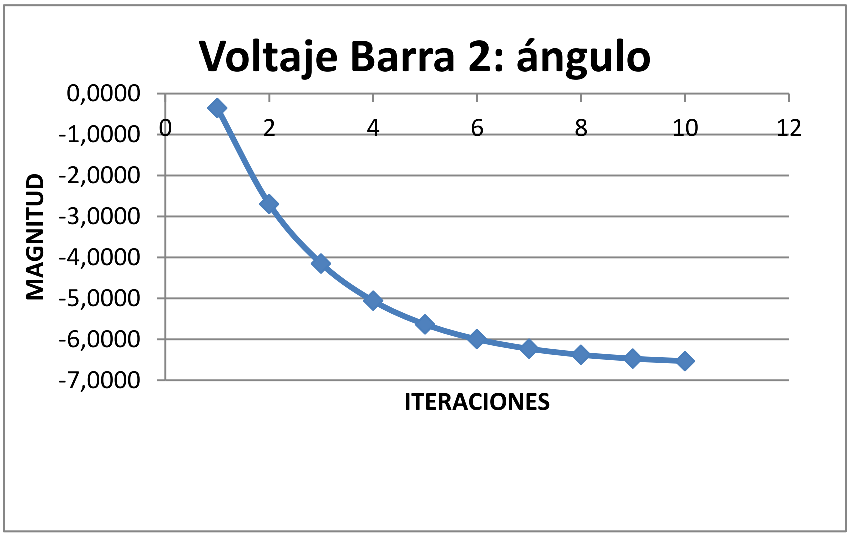
Iteración	Voltaje Barra 2: Magnitud
1	0,9603
2	0,9530
3	0,9476
4	0,9440
5	0,9417
6	0,9402
7	0,9392
8	0,9386
9	0,9382
10	0,9380

2. Magnitud del voltaje en la Barra 3 (p.u.)



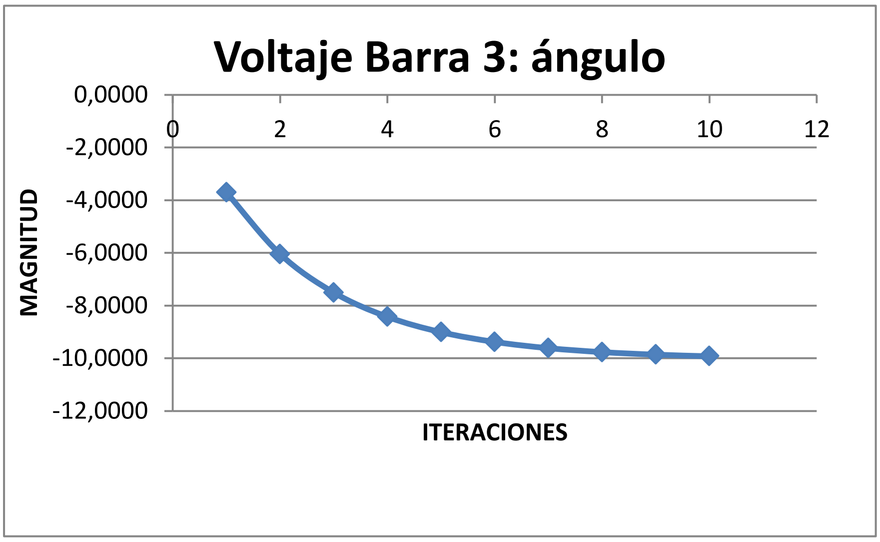
Iteración	Voltaje Barra 3: Magnitud
1	0,95
2	0,95
3	0,95
4	0,95
5	0,95
6	0,95
7	0,95
8	0,95
9	0,95
10	0,95

3. Ángulo del voltaje en la Barra 2 (p.u.)



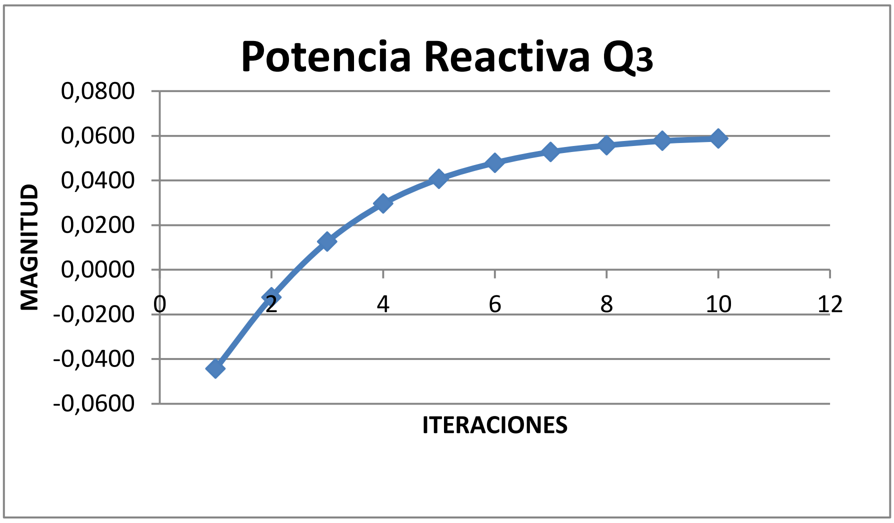
Iteración	Voltaje Barra 2: ángulo
1	-0,3571
2	-2,6995
3	-4,1509
4	-5,0596
5	-5,6329
6	-5,9963
7	-6,2274
8	-6,3748
9	-6,4689
10	-6,5290

4. Ángulo del voltaje en la Barra 3 (p.u.)



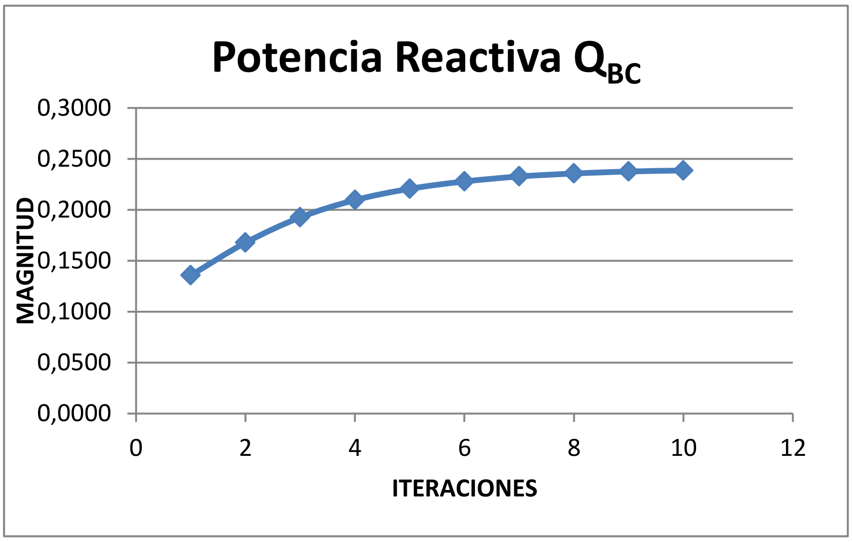
Iteración	Voltaje Barra 3: ángulo
1	-3,7079
2	-6,0471
3	-7,5078
4	-8,4278
5	-9,0105
6	-9,3808
7	-9,6169
8	-9,7675
9	-9,8638
10	-9,9251

5. Potencia reactiva Q_3 (p.u.)



Iteración	Potencia Reactiva Q_3
1	-0,0444
2	-0,0123
3	0,0126
4	0,0296
5	0,0407
6	0,0479
7	0,0528
8	0,0557
9	0,0577
10	0,0587

6. La potencia reactiva Q_{BC} (p.u.)



Iteración	Potencia Reactiva Q_{BC}
1	0,1356
2	0,1677
3	0,1926
4	0,2096
5	0,2207
6	0,2279
7	0,2328
8	0,2357
9	0,2377
10	0,2387