EE4530 Q1 of Semester 1, AY2014-15

Typos in parts (b) and (c): Replace "Bus 1 and Bus 2" by "Bus 2 and Bus 3".

(a)

$$\vec{Y}_{bus} = \begin{bmatrix} 17.94 - j26.92 & -7.69 + j11.54 & -10.25 + j15.38 \\ -7.69 + j11.54 & 23.10 - j34.65 & -15.41 + j23.11 \\ -10.25 + j15.38 & -15.41 + j23.11 & 25.66 - j38.49 \end{bmatrix} \text{pu}$$

$$= \begin{bmatrix} 32.35\angle - 56.31^o & 13.87\angle 123.69^o & 18.48\angle 123.69^o \\ 13.87\angle 123.69^o & 41.64\angle - 56.31^o & 27.78\angle 123.69^o \\ 18.48\angle 123.69^o & 27.78\angle 123.69^o & 46.26\angle - 56.31^o \end{bmatrix} \text{pu}$$

(b)

$\vec{V}_2^1 = 0.935\angle 0^o$ pu, $\vec{V}_3^1 = 0.915\angle - 0.684^o$ pu

(c)

$\vec{S}_1 = 5.991\angle 51.496^o$ pu, $\vec{S}_G = 7.537\angle 51.131^o$ pu, $\vec{S}_{L12} = 0.543\angle 56.295^o$ pu

EE4530 Q1 of Semester 1, AY2013-14

(a)

$\vec{V}_2^1 = 0.99\angle -0.772^o$ pu, $\vec{V}_3^1 = 1\angle 0.0865^o$ pu

Hint: Substitute the initial voltages in the GS equation to get $\vec{V}_2^1$. Using the new $\vec{V}_2^1$, compute Q_3^1. Next compute $\vec{V}_3^1$. You would notice that Q_3^1 is within the given Q limits. This means that the magnitude of $\vec{V}_3^1$ can be maintained/regulated at 1 pu.

(b)

$\vec{S}_{12} = 0.266 + j0.2$ pu, $\vec{S}_{13} = 0.00755$ pu

(c)

$P_{G1} = Real\ (\vec{S}_{12} + \vec{S}_{13}) = 0.2742$ pu

At the end of iteration 1, the total active power generation = $P_{G1} + P_{G3} = 0.2742 + 0.6 = 0.8742$ pu. However the total load active power = Real (0.8 + j0.6) = 0.8 pu.

Since all the lines have no resistances, the line active power losses will be zero. For a lossless system, when the total active power generation of 0.8742 pu is not equal to the total load active power of 0.8 pu, the power flow solution has not converged. A difference between the supply and demand of 0.0742 pu (about 9.28% of load active power) is too big for a converged solution.

EE4530 Q1 of Semester 1, AY2012-13

(a)

$\vec{S}_3 = (200 + j146.05)$ MVA, $Q_{G3} = 146.05$ Mvar

(b)

$\vec{S}_{23} = (-228.93 - j148.01)$ MVA, $\vec{S}_{21} = (-171.07 - j102)$ MVA

(c)

$\vec{S}_{L23} = (9.842 + j19.685)$ MVA