EE 491 HW 03

1)

$$j0.2 \rightarrow \frac{1}{j0.2} = -j2$$

$$j0.4 \rightarrow \frac{1}{j0.4} = -j2.5$$

$$j0.3 \rightarrow \frac{1}{j0.3} = -j3.33$$

$$\overrightarrow{Y_{BUS}} = \begin{bmatrix} -j2 - j2.5 + j0.2 + j0.1 & j2 & j2.5 \\ j2 & -j2 - j3.33 + j0.3 & j3.33 \\ j2.5 & j3.33 & -j2.5 - j3.33 + j0.1 + j0.3 \end{bmatrix}$$

$$\Rightarrow \overrightarrow{Y_{BUS}} = \begin{bmatrix} -j4.2 & j2 & j2.5 \\ j2 & -j5.03 & j3.33 \\ j2.5 & j3.33 & -j5.43 \end{bmatrix}$$

$$\Rightarrow \overrightarrow{Y_{BUS}} = \begin{bmatrix} 4.2\angle -90 & 2\angle 90 & 2.5\angle 90 \\ 2\angle 90 & 5.03\angle -90 & 3.33\angle 90 \\ 2.5\angle 90 & 3.33\angle 90 & 5.43\angle -90 \end{bmatrix}$$

2)

$$0.05 + j0.4 \rightarrow \frac{1}{0.05 + j0.4} = 0.3077 - j2.4615$$

$$0.03 + j0.3 \rightarrow \frac{1}{0.03 + j0.3} = 0.3300 - j3.3003$$

$$0.02 + j0.2 \rightarrow \frac{1}{0.02 + j0.2} = 0.4951 - j4.9505$$

$$\overrightarrow{Y_{BUS}} = \begin{bmatrix} 0.3077 - j2.4615 + 0.3300 \\ -j3.3003 + j0.1 & -0.3077 + j2.4615 & -0.3300 + j3.3003 \\ -0.3077 + j2.4615 & 0.3077 - j2.4615 + 0.4951 \\ & -j4.9505 + j0.1 + j0.3 & -0.4951 + j4.9505 \\ -0.3300 + j3.3003 & -0.4951 + j4.9505 & 0.3300 - j3.3003 + 0.4951 \\ & & -j4.9505 \end{bmatrix}$$

$$\Rightarrow \overrightarrow{Y_{BUS}} = \begin{bmatrix} 0.6377 - j5.6618 & -0.3077 + j2.4615 & -0.3300 + j3.003 \\ -0.3077 + j2.4615 & 0.8028 - j7.0120 & -0.4951 + j4.9505 \\ -0.3300 + j3.003 & -0.4951 + j4.9505 & 0.8251 - j8.2508 \end{bmatrix}$$

$$\Rightarrow \overrightarrow{Y_{BUS}} = \begin{bmatrix} 5.6976\angle -83.57 & 2.4807\angle 97.12 & 3.3168\angle 95.71 \\ 2.4807\angle 97.12 & 7.0578\angle -83.46 & 4.9752\angle 95.71 \\ 3.3168\angle 95.71 & 4.9752\angle 95.71 & 8.2920\angle -84.28 \end{bmatrix}$$

3)

$$0.01 + j0.2 \rightarrow \frac{1}{0.01 + j0.2} = 0.2494 - j4.9875$$

$$0.03 + j0.3 \rightarrow \frac{1}{0.03 + j0.3} = 0.3300 - j3.3003$$

$$\overrightarrow{Y_{BUS}} = \begin{bmatrix} 0.2494 - j4.9875 + 0.3300 \\ -j3.3003 - j4 & -0.2494 + j4.9875 & -0.3300 + j3.3003 & j4 \\ -0.2494 + j4.9875 & 0.2494 - j4.9875 \\ & -j5 & j5 & 0 \\ -0.3300 + j3.3003 & j5 & 0.3300 - j3.3003 \\ & & -j5 - j5 & j5 \\ j4 & 0 & j5 & -j4 - j5 \\ & & & +j0.3 \end{bmatrix}$$

$$\Rightarrow \overrightarrow{Y_{BUS}} = \begin{bmatrix} 0.5794 - j12.2880 & -0.2494 + j4.9875 & -0.3300 + j3.3003 & j4 \\ -0.2494 + j4.9875 & 0.2494 - j9.9875 & j5 & 0 \\ -0.3300 + j3.3003 & j5 & 0.3300 - j13.3000 & j5 \\ j4 & 0 & j5 & -j8.7 \end{bmatrix}$$

$$\Rightarrow \overrightarrow{Y_{BUS}} = \begin{bmatrix} 12.3010\angle -87.30 & 4.9937\angle 92.86 & 3.3168\angle 95.71 & 4\angle 90 \\ 4.9937\angle 92.86 & 9.9906\angle -88.57 & 5\angle 90 & 0 \\ 3.3168\angle 95.71 & 5\angle 90 & 13.3040\angle -88.57 & 5\angle 90 \\ 4\angle 90 & 0 & 5\angle 90 & 8.7\angle -90 \end{bmatrix}$$

4)

$$\overrightarrow{Y_{BUS}} = \begin{bmatrix} -j4 - j6 + j0.1 & j4 & 0 & 0 & j6 \\ j4 & -j4 - j3 + j0.2 & j3 & 0 & 0 \\ 0 & j3 & -j3 - j3 + j0.1 & j3 & 0 \\ 0 & 0 & j3 & -j3 - j5 + j0.2 & j5 \\ j6 & 0 & 0 & j5 & -j6 - j5 + j0.2 \end{bmatrix}$$

$$\Rightarrow \overrightarrow{Y_{BUS}} = \begin{bmatrix} -j9.9 & j4 & 0 & 0 & j6 \\ j4 & -j6.8 & j3 & 0 & 0 \\ 0 & j3 & -j5.9 & j3 & 0 \\ 0 & 0 & j3 & -j7.8 & j5 \\ j6 & 0 & 0 & j5 & -j10.8 \end{bmatrix}$$

$$\Rightarrow \overrightarrow{Y_{BUS}} = \begin{bmatrix} 9.9\angle -90 & 4\angle 90 & 0 & 0 & 6\angle 90 \\ 4\angle 90 & 6.8\angle -90 & 3\angle 90 & 0 & 0 \\ 0 & 3\angle 90 & 5.9\angle -90 & 3\angle 90 & 0 \\ 0 & 0 & 3\angle 90 & 7.8\angle -90 & 5\angle 90 \\ 6\angle 90 & 0 & 0 & 5\angle 90 & 10.8\angle -90 \end{bmatrix}$$