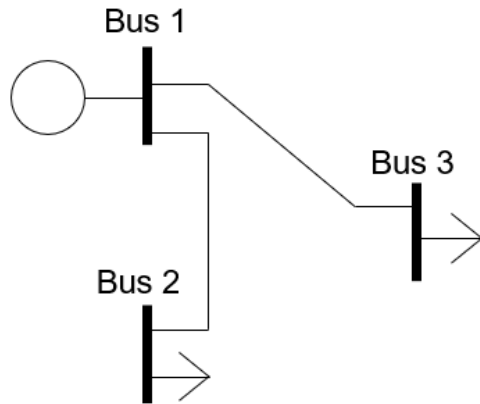


Name: _____ UIN: _____ Section: _____ Score: _____



In this three-bus system ($S_{base} = 100$ MVA)

- The line from bus 1 to bus 2 has an impedance $Z = 0.05 + j0.1$
- The line from bus 1 to bus 3 has an impedance $Z = j0.25$
- The load at bus 2 is consuming 100 MW and 47 Mvar
- The load at bus 3 is consuming 50 MW and 23 Mvar

1. Make the Y-bus matrix for this system

$$Y = \begin{bmatrix} 4 - j12 & -4 + j8 & j4 \\ -4 + j8 & 4 - j8 & 0 \\ j4 & 0 & -j4 \end{bmatrix}$$

2. With Bus 1 as the slack bus, solve the DC power flow (using equation $\theta = B^{-1}P$), to get the estimated bus voltage angles. For the P vector, use the sign convention of power leaving the bus (loads are positive). Hint: to find the inverse of a 2-by-2 diagonal matrix, take the reciprocal of each element.

$$B = \begin{bmatrix} -8 & 0 \\ 0 & -4 \end{bmatrix}$$

$$P = \begin{bmatrix} 1.0 \\ 0.5 \end{bmatrix}$$

$$\theta = B^{-1}P = \begin{bmatrix} -0.125 \\ -0.125 \end{bmatrix}$$

$$\theta_1 = 0, \theta_2 = -7.16^\circ, \theta_3 = -7.16^\circ$$