1. Form $\mathbf{Y}_{\text{Bus}}$ matrix for the network shown here.
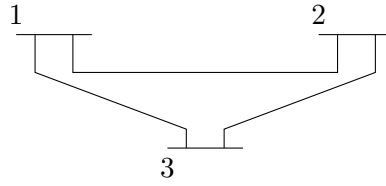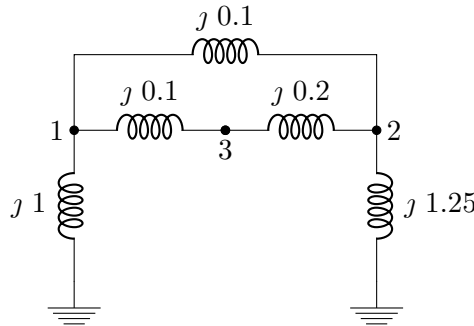

Line	Series Reactance p.u.	Shunt Admittance p.u
1–2	$\jmath\,0.20$	$\jmath\,0.24$
2–3	$\jmath\,0.10$	$\jmath\,0.16$
1–3	$\jmath\,0.25$	$\jmath\,0.30$

Ans: $\mathbf{Y}_{\text{Bus}} = \begin{pmatrix} -\jmath 8.73 & \jmath 5 & \jmath 4 \\ \jmath 5 & -\jmath 14.8 & \jmath 10 \\ \jmath 4 & \jmath 10 & -\jmath 13.77 \end{pmatrix}$

2. Modify $\mathbf{Y}_{\text{BUS}}$ if the line between 1 and 2 is removed.

Ans: $\mathbf{Y}_{\text{Bus}} = \begin{pmatrix} -\jmath 3.85 & 0 & \jmath 4 \\ 0 & -\jmath 9.92 & \jmath 10 \\ \jmath 4 & \jmath 10 & -\jmath 13.77 \end{pmatrix}$

3. Form $\mathbf{Z}_{\text{BUS}}$ matrix for the network shown here by building algorithm.

Ans: $\mathbf{Z}_{\text{Bus}} = \begin{pmatrix} \jmath 0.5699 & \jmath 0.5376 & \jmath 0.5591 \\ \jmath 0.5376 & \jmath 0.5780 & \jmath 0.5511 \\ \jmath 0.5591 & \jmath 0.5511 & \jmath 0.6231 \end{pmatrix}$

4. Modify $\mathbf{Z}_{\text{BUS}}$ if the line between 1 and 2 is removed.

Ans: $\mathbf{Z}_{\text{Bus}} = \begin{pmatrix} \jmath 0.6081 & \jmath 0.4898 & \jmath 0.5686 \\ \jmath 0.4898 & \jmath 0.6378 & \jmath 0.5393 \\ \jmath 0.5686 & \jmath 0.5393 & \jmath 0.6254 \end{pmatrix}$

5. Find the $\mathbf{L}$ and $\mathbf{U}$ triangular factors of the symmetric matrix

$$\mathbf{A} = \begin{pmatrix} 2 & 1 & 3 \\ 1 & 5 & 4 \\ 3 & 4 & 7 \end{pmatrix}$$

Ans: $\mathbf{L} = \begin{pmatrix} 1 & 0 & 0 \\ \frac{1}{2} & 1 & 0 \\ \frac{3}{2} & \frac{5}{9} & 1 \end{pmatrix}$ $\mathbf{U} = \begin{pmatrix} 2 & 1 & 3 \\ 0 & \frac{9}{2} & \frac{5}{2} \\ 0 & 0 & \frac{10}{9} \end{pmatrix}$