1- A 69-kV, three-phase transmission line is 16 km long. The line has a per phase series impedance of 0.125+j0.4375 Ω per km. Use MATLAB program to determine the sending end voltage, voltage regulation, the sending end power, and the transmission efficiency when the line delivers
   a) 70 MVA, 0.8 lagging power factor at 64 kV.
   b) 120 MW, unity power factor at 64 kV.

2- A 230-kV, three-phase transmission line has a per phase series impedance of z=0.05 + j0.45 Ω per km and a per phase shunt admittance of y= j3.4 x 10^{-6} Siemens per km. The line is 80 km long. Using the nominal π model, Use MATLAB program to determine
   a) The transmission line ABCD constants.
   b) Find the sending end voltage and current, voltage regulation, the sending end power and the transmission efficiency when the line delivers
      i) 200 MVA, 0.8 lagging power factor at 220 kV.
      ii) 306 MW, unity power factor at 220 kV.

3- Write a MATLAB function **[z, y, ABCD]=rlc2abcd(r, L, C, f, Length)** to evaluate and return the ABCD transmission matrix, the per phase series impedance per unit length z and the shunt admittance per unit length y for a medium-length transmission line. Where r is the resistance per phase per unit length, L is the inductance per phase per unit length, C is the shunt capacitance per unit length, f is the supply frequency and Length is the line length.

4- Write a MATLAB function **[ABCD]=zy2abcd(z, y, Length)** to evaluate and return the ABCD transmission matrix for a medium-length transmission line, where z is the per phase series impedance per unit length, y is the shunt admittance per unit length and Length is the line length. Then write a program that uses the above function and computes the sending end quantities, voltage regulation, the sending end power and the transmission efficiency for **prob. 2**.

5- Write a MATLAB function **[ABCD]=zy2abcd(z, y, Length)** to evaluate and return the ABCD transmission matrix for a long-length transmission line, where z is the per phase series impedance per unit length, y is the shunt admittance per unit length and Length is the line length.
   Then, write a program that uses the above function and computes the receiving end quantities, voltage regulation, and the line efficiency when sending end quantities are specified. This program should ask for the following quantities:
   The sending end line-to-line voltage magnitude in kV
   The sending end voltage phase angle in degrees
   The three-phase sending end real power in MW
   The three-phase sending end reactive power in Mvar

6- A three-phase transmission line has a per phase series impedance of z=0.03 + j0.4 Ω per km and a per phase shunt admittance of y = j4.0 x 10^{-6} Siemens per km. The line is 125 km long. Use MATLAB program to obtain the ABCD transmission matrix using the appropriate function, then determine the receiving end quantities, voltage regulation, and the line efficiency when the line is sending 407 MW, 7.833 Mvar at 350 kV.

7- The ABCD constants of a lossless three-phase, 500-kV transmission line are
A = D = 0.86 + j0
B = 0 + j130.2
C = j0.002

a) Use MATLAB program to obtain the sending end quantities and the voltage regulation when line delivers 1000 MVA at 0.8 lagging P.F at 500 kV.
b) To improve the line performance, series capacitors are installed at both ends in each phase of the transmission line. As a result of this, the compensated ABCD constants become as follows:

$$\begin{bmatrix} A' & B' \\ C' & D' \end{bmatrix} = \begin{bmatrix} 1 & -\frac{1}{2}jX_c \\ 0 & 1 \end{bmatrix} \begin{bmatrix} A & B \\ C & D \end{bmatrix} \begin{bmatrix} 1 & -\frac{1}{2}jX_c \\ 0 & 1 \end{bmatrix}$$

Where X_c is the total reactance of the series capacitor and X_c = 100 Ω
Write a program to determine the compensated ABCD constants. Then determine the sending end quantities and the voltage regulation when line delivers 1000 MVA at 0.8 lagging power factor at 500 kV.

8- A 500 kV, three phase transmission line is 250 km long. The series impedance is z=0.045+j0.4Ω per phase per km and the shunt admittance is $y=j4*10^{-6}$ siemens per phase per km. The receiving end load is 270 MVA with 0.8 power factor lagging at 325 kV. Using the long line model write M-file script to find the voltage and power at the sending end and the voltage regulation.