Home Work #1

1. The voltage across the network shown below is \( v(t) = \sqrt{2} \ 120\cos(\omega t + \frac{\pi}{6}) \) and the current into the network shown below is \( i(t) = \sqrt{2} \ 10\cos(\omega t - \frac{\pi}{6}) \).

   \[
   \begin{array}{c}
   \hline
   \text{v(t)} \\
   \hline
   \text{+} \\
   \hline
   \text{i(t)} \\
   \hline
   \text{-} \\
   \hline
   \end{array}
   \]

   \text{Single Port Network}

   (a) Determine \( p(t), S, P, \) and \( Q \) into the network.

   (b) Find a simple (two-element) series circuit consistent with the prescribed terminal behavior as described above; i.e., is it an RL or an RC series circuit and what are the values of the parameters.

2. The rms magnitude of the voltage across a single port network is 100. The instantaneous power into the network has a maximum value of 1707 W and a minimum value of -293 W.

   (a) Find a series RL circuit equivalent to the network.

   (b) Determine \( S = P + jQ \) into the network.

   (c) Determine the maximum instantaneous power into \( L \) and compare with \( Q \).

3. A certain single phase load draws 5 MW at 0.7 power factor lagging. Determine the reactive power required from a parallel capacitor to bring the power factor of the parallel combination up to 0.9.