一. Answer the following questions: (60%)
1. How to control the reactive power and real power outputs from the generator and transformer? (12%)
2. What is the voltage regulation of a transmission line? What situation will lead to negative voltage regulation? (12%)
3. How to obtain the symmetrical components from three unbalanced phasors? Describe the advantages of symmetrical components for unbalance fault analysis.(12%)
4. What is the sequence network? Draw the zero-sequence equivalent circuit of a three-phase transformer bank with \( \Delta - \Delta \) winding connection. (12%)
5. Derive the power-angle equation of a transformer with the primary voltage \( E \) and the secondary voltage \( V_s \), and leakage reactance \( jX \). (Assume that the power angle is \( \delta \) and neglecting the loss and excitation current of transformer.) (12%)

二. Consider a three-phase transmission line with a total series impedance of \( 25 + j100 \Omega \) and a shunt impedance of \( -j20 \Omega \), and the receiving-end line-to-line voltage 161kV (rms). Solve the following problems: (40%)
1. Find the \( A,B,C,D \) parameters (transmission parameters) by the \( \pi \)-equivalent circuit model (nominal- \( \pi \) approximation model). (10%)
2. Find the line-to-line voltage at the sending-end when it delivers 20MW with 0.8 power factor lagging at receiving-end by using the parameters obtained above.(10%)
3. Calculate the voltage regulation with respect to full load 25 MW with 0.8 power factor lagging and line-to-line voltage 161kV (rms) at the sending-end, (10%)
4. If the voltage magnitudes of receiving-end and sending-end are constants as the values obtained from problem 3, derive the power circle equation at receiving-end. (10%)