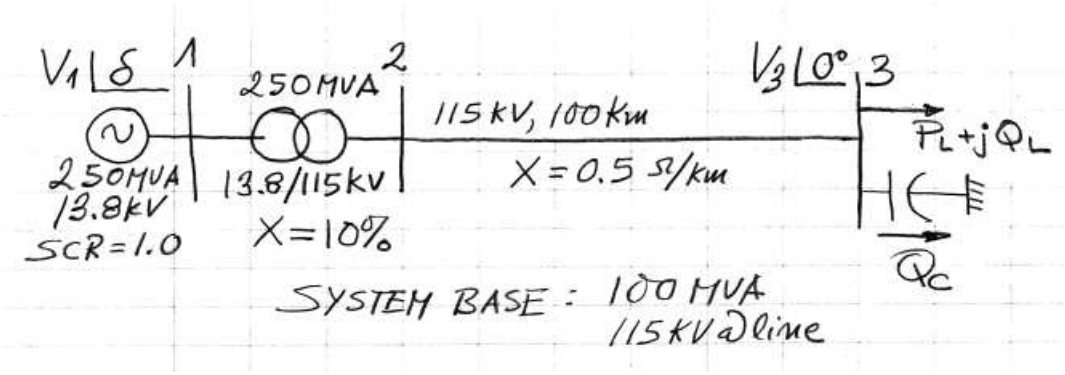
Dept. Electrical and Computer Engineering
The University of British Columbia
EECE 458 Power System Analysis, Fall 2012

EXERCISE No. 6

Tutorial Date: Tuesday 23th October

Power Circle Diagram

Consider the following power transmission system:



Use the circle diagram technique to answer the following questions. The circle diagram is to be built using per unit quantities. Answers are to be given in per unit unless otherwise requested. The voltage at the load is to be maintained at $V_3 = 1.0$ pu. Assume generator bus 1 is voltage regulated.

1. State-1. The system is operating as follows: $P_L = 200$ MW; $Q_L = 200$ MVAR. The capacitor is adjusted for perfect compensation, i.e., $pf = 1.0$ for the total bus load. Show State-1 in a circle diagram from bus 1 to bus 3. Calculate the values of V_1, V_2, Q_c, δ_1, δ_2. If the capacitor bank is connected in Y, calculate the value of the capacitances in pF.

2. State-2. It was found in 1) that the value of V_1 was larger than 1.05 pu. It is suggested to correct this situation by connecting more capacitance in parallel with the load. Is it possible to find a value of Q_c so that $V_1 \leq 1.05$ pu while maintaining the stability limit of $\delta_1 \leq 90°$?