Dept. Electrical and Computer Engineering
The University of British Columbia
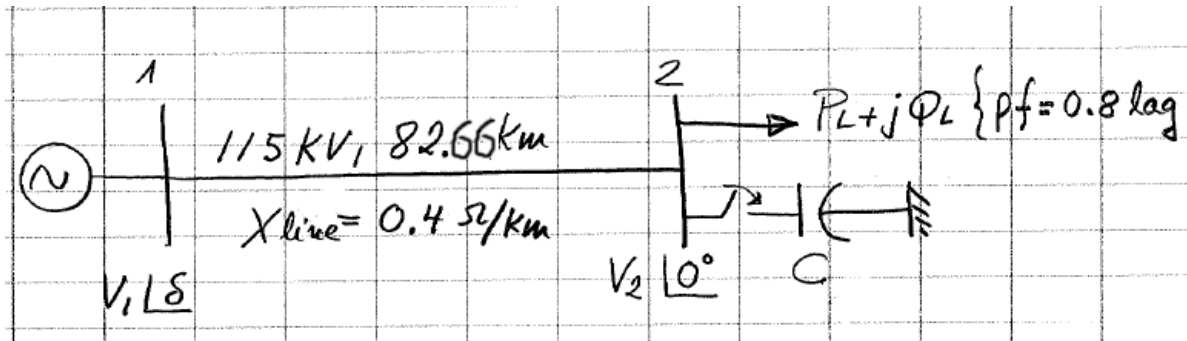EECE 458 Power System Analysis, September 2006

ASSIGNMENT No. 3

IRFAN

Due Date: Tuesday 7 November
POWER CIRCLE DIAGRAM

Consider the following power transmission system

System Base: 100 MVA, 115 kV at bus 1. Bus 1 is voltage regulated.

Draw a per unit Power Circle Diagram at the receiving-end bus 2 to answer the following questions:

1. With $V_2 = 1.0$ pu and $V_1 = 1.05$ pu, determine the maximum active power that can be transmitted without exceeding a transmission angle of $\delta = 30°$.

2. Suppose the load P_L has the value calculated in 1). Taking now into account that Q_L is related to P_L by a power factor $pf = 0.8$ lagging, determine the reactive power Q_c (in MVAR) that must be provided by a bank of capacitors to satisfy the operating condition of 1), that is: $V_2 = 1.0$, $V_1 = 1.05$, $\delta = 30°$, P_L as in 1, Q_L as required by the power factor. Calculate also the value of the capacitors C in μF assuming they are connected in star.

3. Suppose that in order to save money only half of the Q_c calculated in 2) is installed. What would now be the needed V_1 and δ to maintain $V_2 = 1.0$?

4. Verify all your answers using the power transfer formula: $P_2 = \frac{V_1 \cdot V_2}{X} \sin \delta$

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