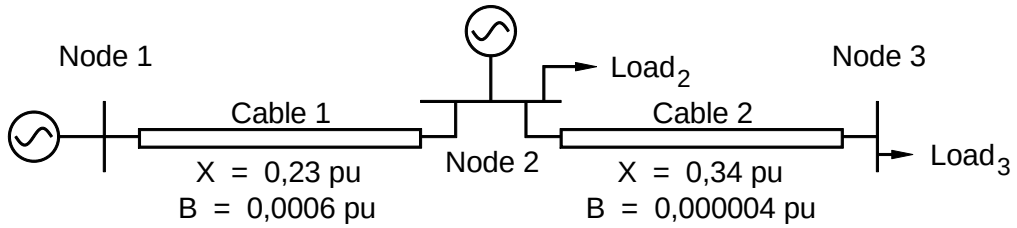
UNIVERSITY OF THE WITWATERSRAND
SCHOOL OF ELECTRICAL AND INFORMATION ENGINEERING
ELEN4018: POWER SYSTEMS
TUTORIAL 2: LOAD FLOW, VOLTAGE STABILITY, TRANSIENT STABILITY

Question 1

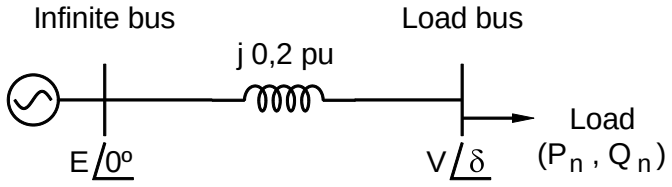
Determine the bus admittance matrix for the following network (use the pi-model for the cables)



$V_1 = 1{,}0$ pu /_ 0º

Question 2

Consider the following equivalent network supplying a constant load power



For a unity power factor load ($Q_n = 0$)

(a) Calculate the required value of E to give a load voltage of 1,0 pu which then gives a load power of 1,0 pu
(b) For the value of E calculated in (a), calculate the two values of voltage on the 'nose curve' for a constant load power of 1,0 pu
(c) For the value of E calculated in (a), calculate the two values of voltage on the 'nose curve' for a constant load power of 1,5 pu

Repeat the above for the load having a power factor of 0,95 (lagging) and then 0,95 (leading).

Question 3

A 1500 MW, balanced, three-phase load is fed via two 275 kV power lines, one having a series impedance of 35 Ω and the other a series impedance of 25 Ω. In bad weather, a three-phase short-circuit occurs on the 35 Ω line. If the load angle of the system increases at a rate of 0.5˚ per millisecond, calculate the maximum duration of the short circuit, before the opening of the faulty line, so that stability of the system is maintained.

Dr JM Van Coller, 2017