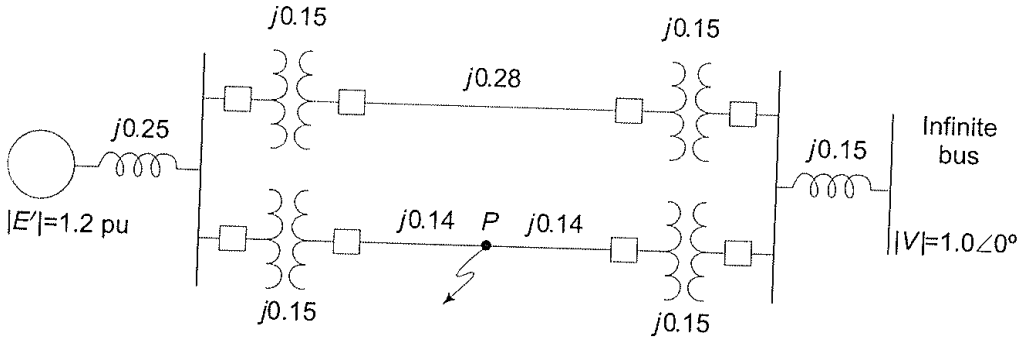
EE 742 - Test # 2

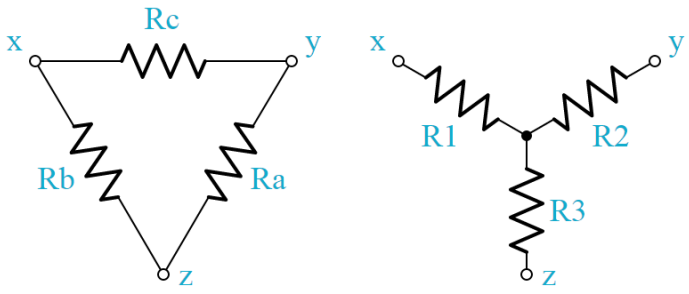
Name:……

Problem 1: Consider the power system below. The generator is delivering 1.0 pu power under pre-fault conditions. A 3-phase fault occurs at point P, followed by opening the faulted line. The following was already determined in Test # 1:

a. The peak value of the real power curve and the initial operating power angle during pre-fault operation: 1.74 pu and 35^o.
b. The peak value of the real power curve during the fault: 0.522 pu,
c. The peak value of the real power curve after opening the faulted line: 1.2245 pu.
d. The critical clearing angle: 51.3^o.



1. Repeat c) and d) above if a capacitor bank with a reactance of –j0.2 pu is inserted along the top line immediately after opening the faulted line. Then compute the value of capacitive reactance that results in a critical clearing angle of 120^o.
2. Repeat c) and d) above if a shunt resistive bank with an impedance of 1 pu is switched at the bus to the left immediately after opening the faulted line (note the new power curve is now shifted to the left). Then compute the value of the resistance that results in a critical clearing angle of 120^o.



$\Delta \rightarrow \mathrm{Y}$ transformation

Equations for transforming a Δ network into a Y network:

$$R1 = \frac{Rb\,Rc}{Ra + Rb + Rc}$$

$$R2 = \frac{Ra\,Rc}{Ra + Rb + Rc}$$

$$R3 = \frac{Ra\,Rb}{Ra + Rb + Rc}$$

$\mathrm{Y} \rightarrow \Delta$ transformation

Equations for transforming a Y network into a Δ network:

$$Ra = \frac{R1\,R2 + R2\,R3 + R3\,R1}{R1}$$

$$Rb = \frac{R1\,R2 + R2\,R3 + R3\,R1}{R2}$$

$$Rc = \frac{R1\,R2 + R2\,R3 + R3\,R1}{R3}$$