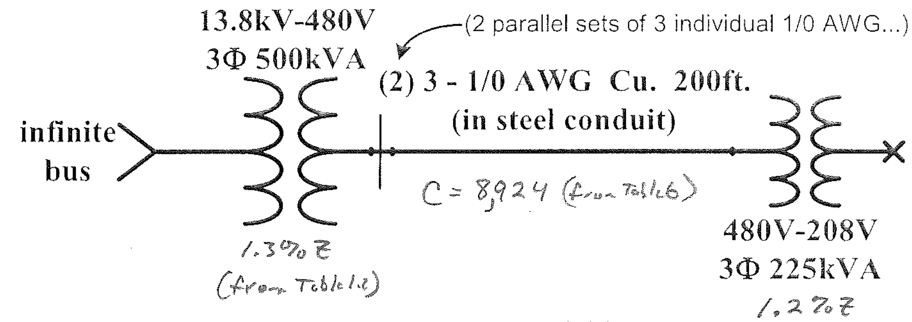
ECET 4530 – Spring 2014 **Must be submitted by: 7:30pm on Tuesday November 25th**

Industrial Distribution & NEC – Exam II pt. B **Print Name (Last Name First):** ____________

Instructions: Part "B" of this exam is composed of a set of "take-home" problems that must be completed individually, under "closed-book" conditions, with absolutely no assistance from any other person or resource except for the PowerPoint slides provided on the course website.

Problem #9) Given the 3Φ distribution system shown in the following figure:

Note - Assume a 75°C terminal temperature rating and a 30°C ambient temperature.



a) Determine the 3Φ, L-L-L **short circuit current** available at the secondary terminals of the 500kVA transformer using the point-to-point method of calculation.

$I_{FLA_S} = \frac{500,000}{\sqrt{3}(480)} = 601.4A$

$m = \frac{100\%}{1.3\%} = 76.9$ $\quad I_{SCA_S} = I_{FLA} \cdot m = 46,262A$

$I_{SCA(SecT1)} =$ 46,262 amps

b) Determine the 3Φ, L-L-L **short circuit current** available at "load-end" of the 200' feeder that connects the two transformers.

$f = \frac{\sqrt{3}(200)(46,262)}{(8924)(2)(480)} = 1.87$

$m = \frac{1}{1+f} = \frac{1}{1+1.87} = 0.34836$ $\quad I_{SCA_F} = (46,262)(0.34836) = 16,116\ A$

$I_{SCA(Feeder)} =$ 16,116 amps

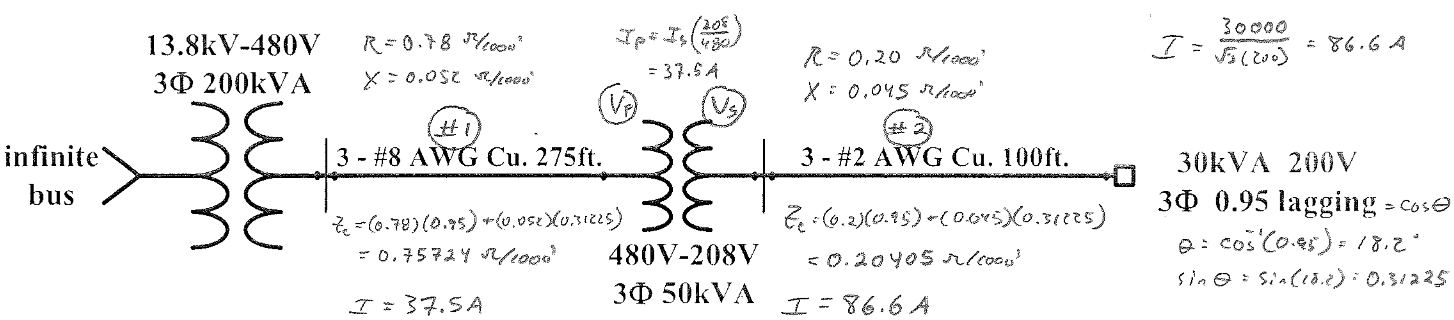
c) Determine the 3Φ, L-L-L **short circuit current** available at the secondary terminals of the 480-208V transformer using the point-to-point method of calculation.

$f = \frac{\sqrt{3}(16,116)(480)(1.2)}{(100,000)(225)} = 0.7146$

$m = \frac{1}{1+0.7146} = 0.583$ $\quad I_{SCA_S} = (16,116)(0.583)\left(\frac{480}{208}\right) = 21,691\ A$

$I_{SCA(SecT2)} =$ 21,691 amps

Problem #10) Given the 3Φ distribution system shown in the following figure:



Neglecting any transformer losses, determine the ***operational line-voltage*** seen at the load outlet assuming that rated voltage is present at the secondary terminals of the 200kVA transformer and that the load is drawing rated power.

(Note – also assume that both circuits are fed through aluminum conduit and that the operational temperature of the circuit conductors is 60°C.)

Note: Vdrop is 4% of "rated" line voltage @ Load

$V_{drop\#1\,(Line)} = \sqrt{3}\, I\, Z_c \frac{\ell}{1000} = \sqrt{3}(37.5)(0.75724)\frac{275}{1000} = 13.535V$

$V_P = 480 - 13.535 = 466.465V$ $\quad V_S = V_P\left(\frac{208}{480}\right) = 202.135V$

$V_{Line(Load)} =$ 199.1 volts

$V_{drop\#2\,(Line)} = \sqrt{3}(86.6)(0.20405)\left(\frac{100}{1000}\right) = 3.06V$ $\quad V_{Load} = 202.135 - 3.06 = 199.07\ V$