EEET – 241 PROJECT #1

Read the Assignment carefully – it should look similar to something you have done before (but not exact). Don't try to do the work on these sheets – make your own sheets and just label the first page with "EEET-241 Project #1" and your name.

Step: 1

Draw the circuit of a three phase 4160/2400V generator. It should be on the left side of your page.

> Note, from the description (4160/2400V), that the generator is a WYE configured generator (4160V line-to-line, 2400V phase voltage). Ignore any generator impedance (assume $Z_{generator}$ = 0 ohms). Draw this first before you go to the next item.

Connect the generator to the primary of a three phase transformer. You will only have three "lines" (wires) from the generator to the transformer primary. The transformer is rated as 1000KVA, 4160-208/120V, 60 Hz. Ignore the transformer impedances (assume an ideal transformer –> $Z_{transformer}$ = 0%). In this step, there is no load on the transformer – the secondary of the transformer is open circuited.

> Note, from the description (4160-208/120V), that we know that this transformer is a Delta configured primary (4160V phase voltage and 4160V line-to-line) and a WYE configured secondary (208 line-to-line, 120V phase voltage).

Project #1
Step: 2
Clearly label and determine each voltage. Hint: There is no calculation needed, you have all of the numbers needed – just label them on the drawing.

- The voltage ($V_{generator\ phase}$) across each phase of the generator.
- The voltage ($V_{generator\ line\text{-}line}$) across each line-to-line of the generator.
- The voltage ($V_{primary\ line\text{-}line}$) across each line-to-line of the primary of the transformer.
- The voltage ($V_{primary\ phase}$) across each phase of the primary of the transformer.
- The voltage ($V_{secondary\ phase}$) across each phase of the secondary of the transformer.
- The voltage across each line-to-line from the secondary of the transformer to the load ($V_{secondary\ line\text{-}line}$).

Calculate the no load voltage (V_{nl}) for each phase and each line-to-line of the secondary of the transformer. Be sure you show what this voltage is on the circuit diagram. (Hint: This is not difficult – you already determined it – just indicate them.)

Project #1
Step: 3
Connect a 1000 ohm (1KΩ) resistor across each phase of the secondary of the transformer to neutral (balanced load of three resistors). Redraw the circuit above with the load shown.

Step: 4
Determine the voltage (V_{load}) across each resistor. Be sure you show what this voltage is on the circuit diagram.

Find the current (I_{load}) through each resistor connected to the secondary of the transformer (the load).

Determine the current for each line from the secondary of the transformer to each load ($I_{secondary\ line}$).

Determine the current ($I_{secondary\ phase}$) in each phase of the secondary of the transformer.

Determine the current ($I_{primary\ phase}$) in each phase of the primary of the transformer.

Determine the current for each line to the primary of the transformer ($I_{primary\ line\text{-}line}$).

Determine the current in each generator line feeding the primary of the transformer ($I_{generator\ line}$).

Determine the current in each generator phase ($I_{generator\ phase}$).

Project #1
Step: 5
From the numbers above, determine:

The power delivered by each phase of the generator.
The total power delivered by the generator.

The power delivered to each phase of the transformer primary.
The total power into the primary of the transformer.

The power delivered by each phase of the transformer secondary.
The total power out of the secondary of the transformer.

The power dissipated in each load resistor.
The total power delivered to the load (all three resistors).

Hint: The total power delivered to the load should be the same as the total power delivered by the generator – check your answer.