Power Grids Test #1

An electrical object is something that?

1. Produces electricity
2. Transmits electricity
3. Consumes electricity

Objects that produce electricity are?

* Alternators / Generators
* Inverters

Objects that transmit electricity are:

* Wires
* Transformers

An object that consumes electricity is called a?

Load

Give an example of a load.

Light bulb or anything that fits

All electrical devices do what?

Produce heat

Generally, the interconnection between generation (Power producing equipment) and the consumers is made up of?

Transmission and distribution lines.

Transmission lines (wires) are of the highest voltage and transmit electricity the?

Greatest distance.

Distribution lines transmit electricity from substations to?

Consumers.

Describe the electrical distribution system

* The transmission system feeds into substations that distribute the electricity through the distribution system to consumers.
* Substations operate at a lower voltage for safety, and it doesn’t move the electricity as far as the transmission system.

Describe the reclosure.

* is a high voltage automatic switch that senses faults and opens the distribution line.
* It will normally open and reclose the line to see if the fault has cleared.
* A maximum of 4 times will the reclosure try to clear the fault.
* After the set number of tries, the reclosure will stay open until closed after the fault was repaired or removed.

Describe the size of a grid?

* Geographically it can span many thousands of miles or as small as just between households.
* Great variances in grid sizes.
* Belize Electricity Limited (BEL) national grid has approximately 1900 miles of transmission and distribution lines.
* Grids that are between households and those that run small communities are called micro-grids.

Draw the single-phase split phase service.

Table

Description automatically generated

Draw the 3-phase service at 208V.

Diagram

Description automatically generated

Name two organizations that regulate the rules to connect to the grid?

* The group IEEE ( Institute of Electrical and Electronics Engineers) have established the rules for grids and connecting power sources to the grid.
* Then UL (Underwriters Laboratories) 1741which sets out the parameters for equipment connecting to a grid.

Name two of the grid assumptions / rules: And describe them.

* The grid is all points from generation to consumer.
* Grid must be of a voltage at the load, that the loads can operate at.
* Must be at an AC frequency that the loads are designed to operate at.
* Have enough capacity in generation to supply the loads.
* The grid is designed to operate within certain parameters.
* The parameters are around voltage and frequency.
* The voltage will be maintained between a minimum and maximum value.
* The frequency of the grid will be maintained between a lower and upper limit with a sinusoidal voltage shape.

What is nominal voltage?

* It is the voltage that is set to a standard value.
* Just some of the nominal voltages in AC (RMS) are:
* 120,240,120,208,4160,13.8kV and 69kV

60Hz happens 60 times per second or every 20mSeconds.

True

False

Describe the voltage relationship coming out of a generator.

Any two of these is suffice for an answer.

* There are three sections of these coils called “A”, “B”, and “C” phase.
* The voltage produced in each of these phases are peaking 120 degrees apart.
* Potential difference between these is just that, potential difference, which is a subtraction between each voltage, at the angular distance between them.

In Belize the nominal consumer voltages are?

* 120-240 (Split Phase)
* 120 / 208 (Single / 3-Phase)
* 277 / 480 ( 3-Phase)

Describe why the voltages between phases of a 3-phase system is not just the simple subtraction as in 120 / 208.

* The potential difference (subtracting the voltages) is
* VAB = VAn – VBn
* 120L0 degrees – 120L-120 degrees

Subtracting take the rectangular form of each voltage

Cosine Sine

* 120 +j0
* - -60 -j103.9
* = +180 +j103.9
* Judge the answer as you feel comfortable.