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Aziznagar Gate, Chilkur Balaji Road, Hyderabad - 500 075.

Department: Electrical & Electronics Engineering

Innovative Teaching Method

Academic Year : 2022-23

Title of Innovative method/activity **:** Flipped Class Room

Name of the faculty **:** Mrs S.Chaitanya

Designation **:** Assistant Professor

Course Name **:** EHVAC Transmission

Objective of method: This activity orients such that the students are assisted to remember the concepts of the course during their examinations. Also inculcate the interest and involvement of students completely during the lecture session and understand the topics easily.

Topic Covered through activity: Corona loss and measurement of audible noise

Description of method: A flipped classroom is an instructional strategy and a type of blended learning, which aims to increase student engagement and learning by having pupils complete readings at home and work on live problem-solving during class time. This style of teaching also involves giving students the at-home tasks of reading from textbooks or practicing concepts by working, for example, on problem sets. Students watch online lectures, collaborate in online discussions, or carry out research at home, while actively engaging concepts in the classroom, with a mentor's guidance. In planned flipped teaching lessons, the teacher hands out lesson teaching material one week before the lesson is scheduled for the students to prepare talks.

Fig: Flipped Classroom

Corona Effects-I: Power Loss and Audible Noise

The average power-handling capacity of a 3-phase e.h.v. line and percentage loss due to I 2R heating were discussed. Representative values are given below for comparison purposes.

System kV	400		750		1000		1150	
Line Length, km	400	800	400	800	400	800	400	800
3-Phase MW/circuit ($P = 0.5\ V^2/xL$)	640	320	2860	1430	6000	3000	8640	4320
% Power Loss = 50 r/x	4.98%		2.4%		0.8%		0.6%	
kW/km Loss, 3-phase	80	20	170	42.5	120	30	130	32.5

When compared to the I^2R heating loss, the average corona losses on several lines from 345 kV to 750 kV gave 1 to 20 kW/km in fair weather, the higher values referring to higher voltages. In foul-weather, the losses can go up to 300 kW/km. Since, however, rain does not fall all through the year (an average is 3 months of precipitation in any given locality) and precipitation does not cover the entire line length, the corona loss in kW/km cannot be compared to I2R loss directly.

A reasonable estimate is the yearly average loss which amounts to roughly2 kW/km to 10 kW/km for 400 km lines, and 20-40 kW/km for 800 km range since usually higher voltages are necessary for the longer lines. Therefore, cumulative annual average corona loss amounts only to 10% of I2R loss, on the assumption of continuous full load carried. With load factors of 60 to 70%, the corona loss will be a slightly higher percentage. Nonetheless, during rainy months, the generating station has to supply the heavy corona loss and, in some cases, it has been the experience that generating stations have been unable to supply full rated load to the transmission line. Thus, corona loss is a very serious aspect to be considered in line design.

When a line is energized and no corona is present, the current is a pure sine wave and capacitive. It leads the voltage by 90°, as shown in Figure 3.1(a). However, when corona is present, it calls for a loss component and a typical waveform of the total current is as shown in Figure 3.1 (b). When the two components are separated, the resulting in phase component has a waveform which is not purely sinusoidal, Figure 3.1 (c). It is still a current at power frequency, but only the fundamental component of this distorted current can result in power loss.

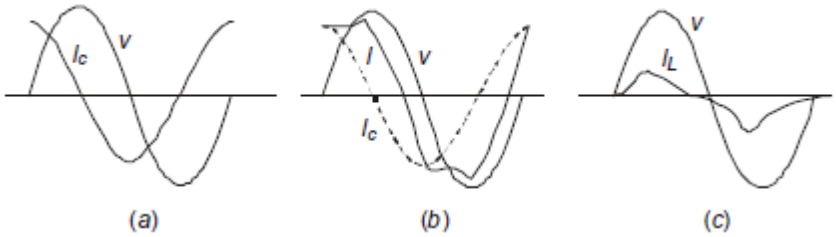

Fig:1 Corona current waveform.

CORONA-LOSS FORMULAE

List of Formulae

Corona-loss formulae were initiated by F.W. Peek Jr. in 1911 derived empirically from most difficult and painstaking experimental work. Since then a horde of formulae have been derived by others, both from experiments and theoretical analysis. They all yield the power loss as a function of (*a*) the corona-inception voltage, *Vo*; (*b*) the actual voltage of conductor, *V*; (*c*) the excess voltage (*V* — *Vo*) above *Vo*; (*d*) conductor surface voltage gradient, *E*; (*e*) corona-inception gradient, *E*o; (*f*) frequency, *f*; (*g*) conductor size, *d*, and number of conductors in bundle, *N*, as well as line configuration; (*h*) atmospheric condition, chiefly rate of rainfall, r, and (*i*) conductor surface condition.

A. Those Based on Voltages

(i) Linear relationship: Skilling's formula (1931):

$Pc \alpha V - Vo$

(ii) Quadratic relationship

(a) Peek's formula (1911):

$Pc \alpha (V - Vo)2$

(b) Ryan and Henline formula (1924):

$Pc \alpha V (V - Vo)$

(c) Peterson's formula (1933):

$Pc \alpha V2. F (V/Vo)$

where F is an experimental factor.

(iii) Cubic Relationship

(a) Foust and Manger formula (1928):

Pc α V3

(b) Prinz's formula (1940):

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Pc α V2 (V – Vo)

B. Those Based on Voltage Gradients

(a) Nigol and Cassan formula (1961):

Pc α E2 In (E/Eo)

(b) Project EHV formula (1966):

Pc α V. Em, m = 5

In order to obtain corona-loss figures from e.h.v. conductor configurations, outdoor experimental projects are established in countries where such lines will be strung. The resulting measured values pertain to individual cases which depend on local climatic conditions existing at the projects. It is therefore difficult to make a general statement concerning which formula or loss figures fit coronal losses universally

AUDIBLE NOISE: GENERATION AND CHARACTERISTICS

When corona is present on the conductors, e.h.v. lines generate audible noise which is especially high during foul weather. The noise is broadband, which extends from very low frequency to about 20 kHz. Corona discharges generate positive and negative ions which are alternately attracted and repelled by the periodic reversal of polarity of the ac excitation. Their movement gives rise to sound-pressure waves at frequencies of twice the power frequency and its multiples, in addition to the broadband spectrum which is the result of random motions of the ions, as shown in Figure 3.3. The noise has a pure tone superimposed on the broadband noise. Due to differences in ionic motion between ac and dc excitations, dc lines exhibit only a broad bandnoise, and furthermore, unlike for ac lines, the noise generated from a dc line is nearly equal in both fair and foul weather conditions. Since audible noise (AN) is man-made, it is measured in

the same manner as other types of man-made noise such as aircraft noise, automobile ignition noise, transformer hum, etc.

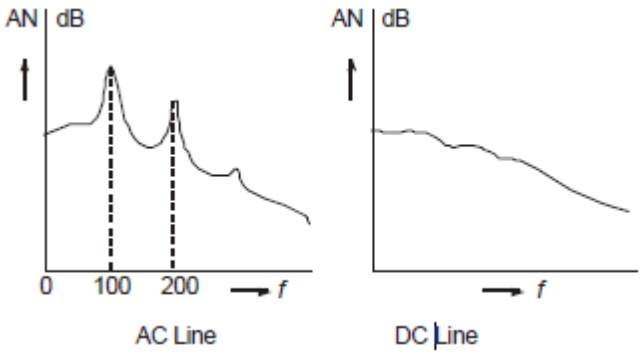

Fig: 2. Audible Noise frequency spectra from ac and dc transmission lines

Audible noise can become a serious problem from 'psycho-acoustics' point of view, leading to insanity due to loss of sleep at night to inhabitants residing close to an e.h.v. line. This problem came into focus in the 1960's with the energization of 500 kV lines in the USA. Regulatory bodies have not as yet fixed limits to AN from power transmission lines since such regulations do not exist for other man-made sources of noise. The problem is left as a social one which has to be settled by public opinion.

LIMITS FOR AUDIBLE NOISE

Since no legislation exists setting limits for AN for man-made sources, power companies and environmentalists have fixed limits from public-relations point of view which power companies have accepted from a moral point of view. In doing so, like other kinds of interference, human beings must be subjected to listening tests. Such objective tests are performed by every civic minded power utility organization. The first such series of tests performed from a 500-kV line of the Bonneville Power Administration in the U.S.A. is known as Perry Criterion. The AN limits are as follows:

No complaints: Less than 52.5 dB (A),

Few complaints: 52.5 dB (A) to 59 dB (A),

Many complaints: Greater than 59 dB (A),

The reference level for audible noise and the dB relation will be explained later. The notation (A) denotes that the noise is measured on a meter on a filter designated as A-weighting network. There are several such networks in a meter.

Design of line dimensions at e.h.v. levels is now governed more by the need to limit AN levels to the above values. The selection of width of line corridor or right-of-way (R-O-W), where the nearest house can be permitted to be located, if fixed from AN limit of 52.5 dB(A), will be found adequate from other points of view at 1000 to 1200 kV levels. The audible noise generated by a line is a function of the following factors:

(a) the surface voltage gradient on conductors,

(b) the number of sub-conductors in the bundle,

(c) conductor diameter,

(d) atmospheric conditions, and

(e) the lateral distance (or aerial distance) from the line conductors to the point where noise is to be evaluated.

The entire phenomenon is statistical in nature, as in all problems related to e.h.v. line designs, because of atmospheric conditions. with atmospheric conditions but also with the hours of the day and night during a 24-hour period. The reason is that a certain noise level which can be tolerated during the waking hours of the day,26 when ambient noise is high, cannot be tolerated during sleeping hours of the night when little or no ambient noises are present.

AN MEASUREMENT AND METERS

Decibel Values in AN and Addition of Sources:

Audible noise is caused by changes in air pressure or other transmission medium so that it is described by Sound Pressure Level (SPL). Alexander Graham Bell established the basic unit for SPL as 20 × 10–6 Newton/m2 or 20 micro-Pascals [2 × 10–5 micro bar]. All decibel values are referred to this basic unit. In telephone work there is a flow of current in a set of head-phones or receiver. Here the basic units are 1 milliwatt across 600 ohms yielding a voltage of 775 mV and a current of 1.29 mA. For any other SPL, the decibel value is

$$\text{SPL (dB)} = 10 \text{ Log10 } (\text{SPL}/20 \times 10\text{–}6) \text{ Pascals}$$

This is also termed the 'Acoustic Power Level', denoted by PWL, or simply the audible noise level, AN.

Fig: Flipped Class Room

Outcome: students are able to understand the concepts clearly.

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Innovative Teaching Methods 2022-23

Title of Innovative method/activity : Activity based Learning

Name of the faculty : Dr. C. N. Ravi

Designation : Professor

Course Name **:** Microprocessor and Interfacing Devices

Objectives of method: This activity orients the students such that they are assisted to remember and recall the basic concepts of the course during their examinations. Also inculcate the interest and involvement of students completely during the lecture sessions.

Topic Covered through activity: Memory Organization in the 8086 Microprocessor

Description of method: Two students are assigned BHE and A0, Twenty students are assigned as the address bus and used to locate the address of the data. The multiplexed address data bus – students carry the data back to the microprocessor.

There are 20 address lines in the 8086 microprocessor. This gives us 220 different memory locations. Hence the total size is 220 Bytes (as each memory location is Byte Addressable, i.e. one byte of data can be stored at every single location), which is equal to 1MB. Even the memory is byte-addressable, yet the 8086 microprocessor an easily handle up to 16 bits of data at a time through its 16 data lines. So, to organize the memory efficiently, the entire memory in 8086 is divided into two memory banks: odd bank and the even bank.

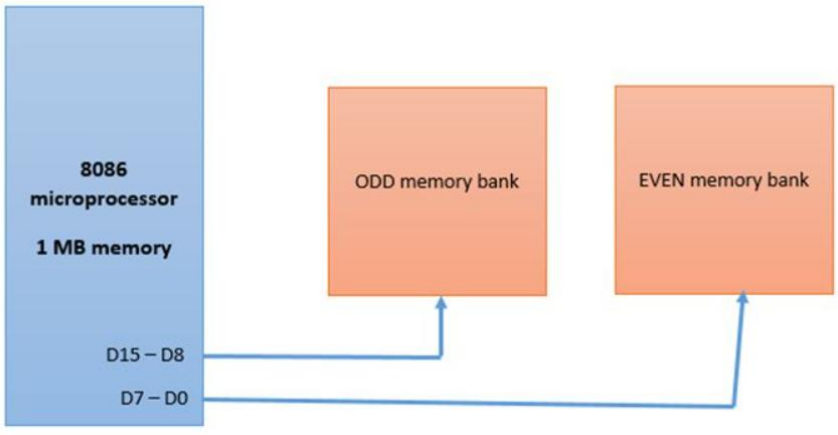

Figure 1: Memory organization in 8086 micro processor

The way in which data is read or written is decided by the value of BHE, and the last address bit, that is the A0 line. It is done in the following way:

$\overline{BHE}$	A0	Operation performed on memory
0	0	16 bits of data will be read or written into the memory
0	1	8 bits of data will be read/written into the odd memory bank
1	0	8 bits of data will be read/written into the even memory bank
1	1	No operation is performed

To read or write 8 bits of data, it would require only 1 CPU cycle, no matter the data is stored in any of the memory banks, but to read or write 16 bits of data, the BIU of the 8086 may require either 1 or 2 memory cycles depending upon whether the lower byte of word is located at even or odd memory address.

1. If the lower byte of the word is stored at even memory bank and the upper byte is stored at odd memory bank then the CPU will require only 1 memory cycle. So, it is better to store data in this way.

2. If the lower byte of the word is located at an odd memory address, then the CPU will require 2 memory cycles. The first memory cycle is required for accessing the lower byte of the word through the higher data bus, i.e. D15 to D8, and the second memory cycle is required for accessing the upper byte of the word through the lower data bus, i.e. D7 to D0.

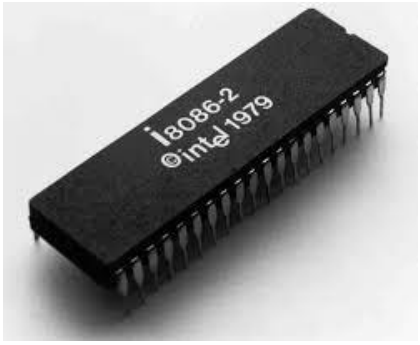

Figure 2: Microprocessor

Figure 3: Microprocessor kit

Figure 2 shows the image of microprocessor 8086. Microprocessor kit with all the additional interface is connected to the 8086 microprocessor is given in the figure 3. Figure 4 shows the assignment of the role to individual students. Students are assigned to address bus, BHE and A0 pins. Figure 5 shows the data collection from the memory as a small pocket.

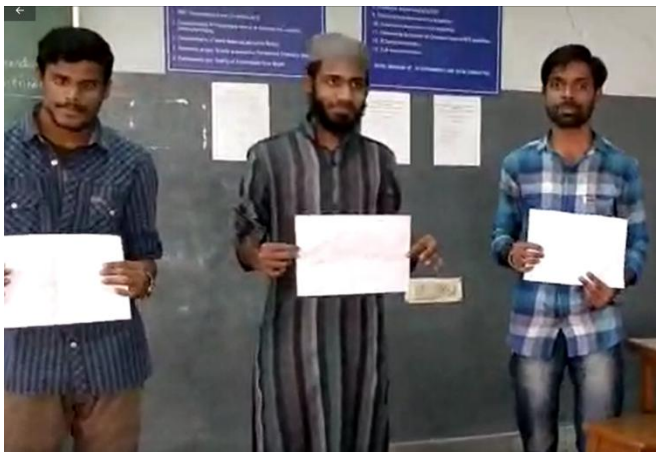

Figure 4: Students assigned their role

Figure 5: Data collection from the memory

Address and data transfer is depicted in the figure 6. The students in the classroom are shown in the figure 7.

Figure 6: Data transferring

Figure 7: Students in the Classroom

Outcome: Students understand the memory organization in the microprocessor and data transfer mechanism from the memory to microprocessor.

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Innovative Teaching Methods-2022-23

Title of Innovative method/activity	**:** Crossword
Name of the faculty	**:** Mr L.Raju
Designation	**:** Assistant Professor
Course Name	**:** Electrical Machines

Objectives of method: This activity orients such that the students are assisted to remember and recall the basic concepts of the course during their examinations. Also inculcate the interest and involvement of students completely during the lecture sessions.

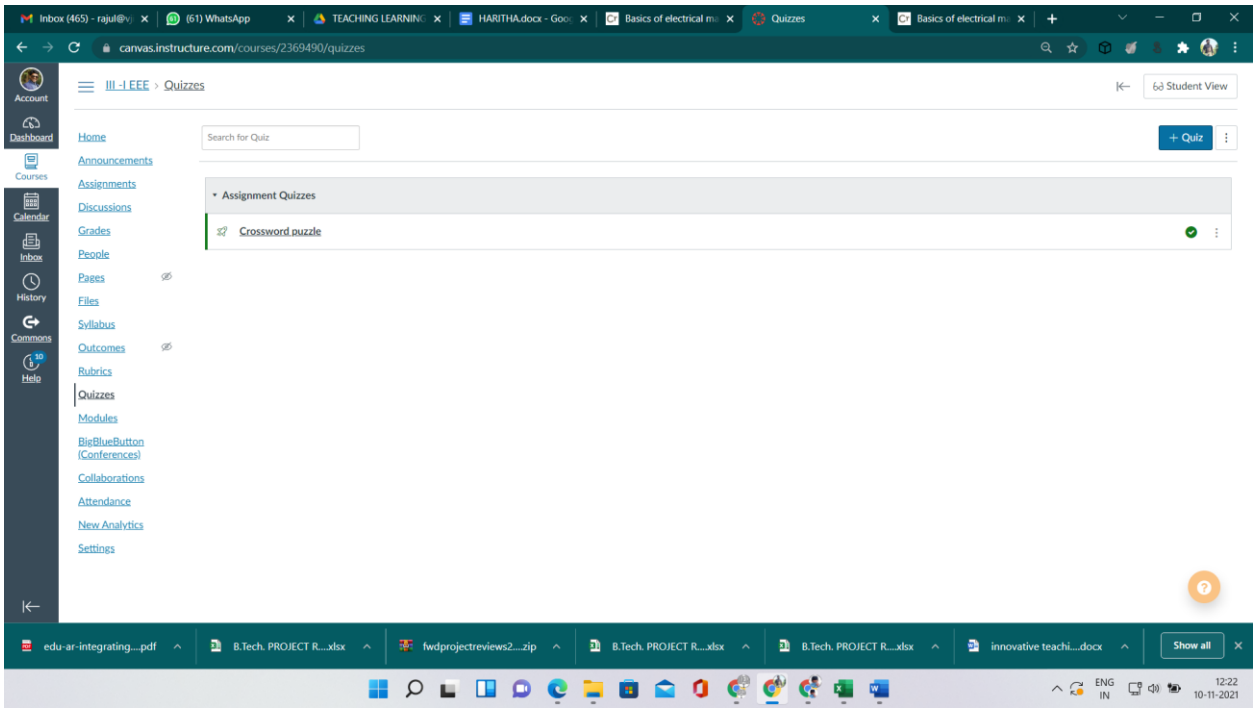
Topic Covered through activity: Basics of Electrical Machines (Construction and operation of DC and AC Machines)

Description of method: The course like Electrical Machines includes more theoretical concepts, hence a method is required to remember the key words related to those concepts. This activity includes a set of questions related to the key words in each chapter. The questions can be the meaning, definition of that word etc. With the help of the clue's given students are expected to fill the blank squares provided in a particular pattern.

This activity is conducted before their internal or soon after completion of that particular module so as to ensure that important words or phrases are clearly understood by the students.

Url: https://crosswordlabs.com/embed/basics-of-electrical-machines

Outcome: students visualization skills were improved.



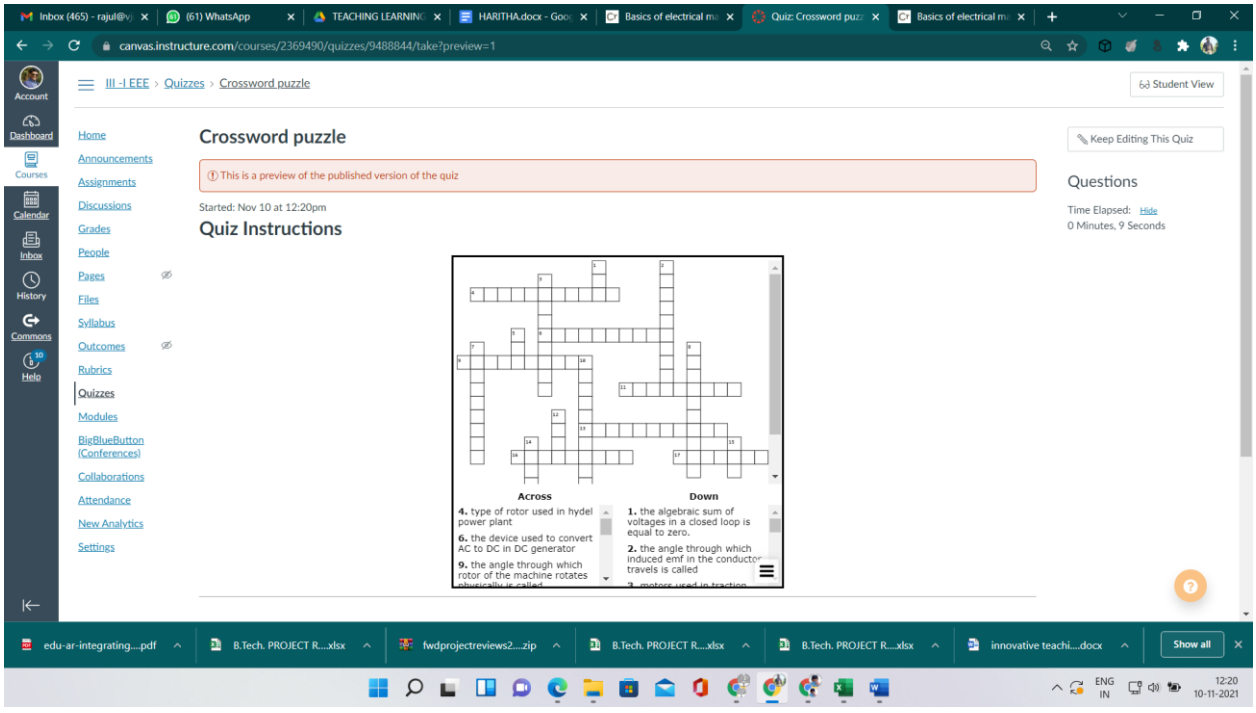


Fig: crossword puzzle

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Department : Electrical &Electronics Engineering

Teaching and Learning Methods
Academic Year : 2022-23

Prepared by:

B.Rajesh

Assistant Professor

Subject: Power Electronics

Academic Year: 2022-23

Title of Innovative method/activity: **Pictionary**

Pictionary focuses on giving clarity of concepts related with circuit diagrams and block diagrams in the co-construction of knowledge

Aim of the method: To allow students to convey the meaning of the concept through pictures such that logical skills, creativity, retention and cognition is improved.

Implementation/Portrayal of method:

This teaching method is inspired from dumb charades guessing game. This activity is done by teams where the students try to identify the picture/ block diagram/ circuit or any concept related with pictures enacted by their teammates and have to draw the picture/ block diagram /circuit correctly on the blackboard in the stipulated time.

Benefits of method: This activity helps the students to remember the block diagrams, circuits and also the concepts with means of pictures and block diagrams.

Topic: Single Phase Controlled Converters, DC-DC Choppers

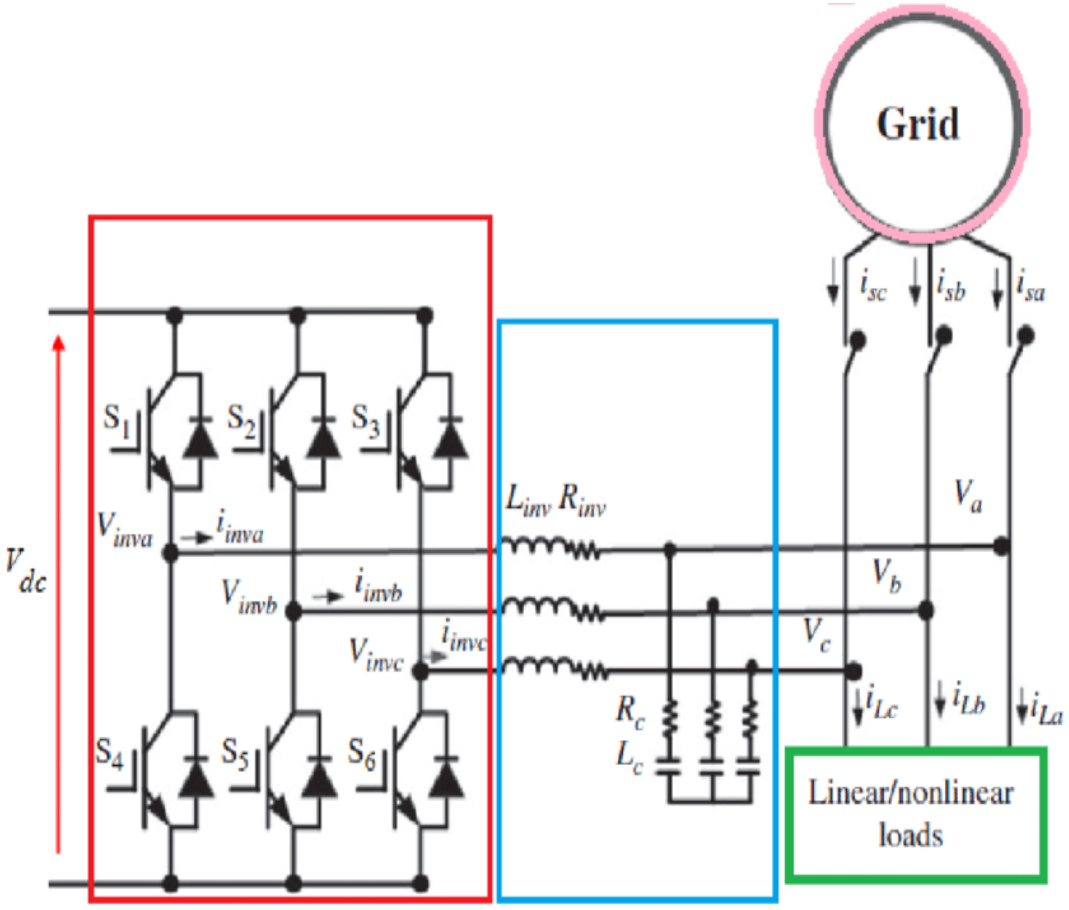

PICTIONARY


PICTIONARY

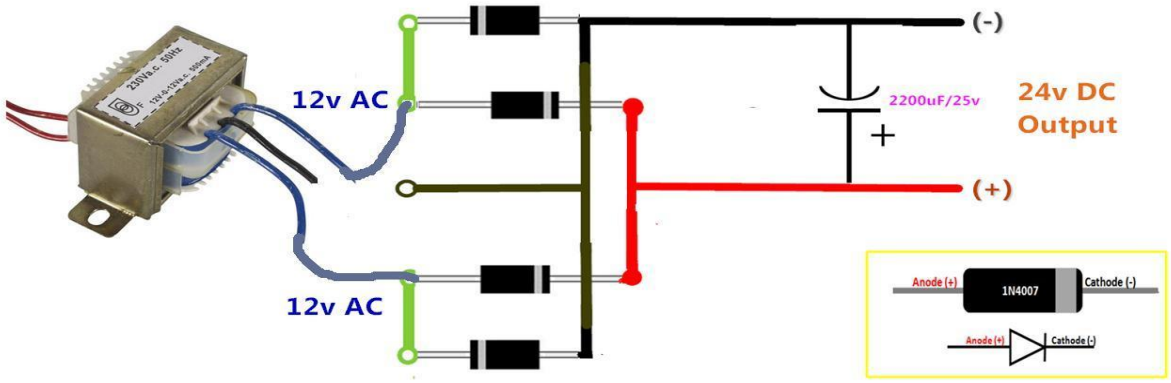
Fig: Pictionary

PICTURES:

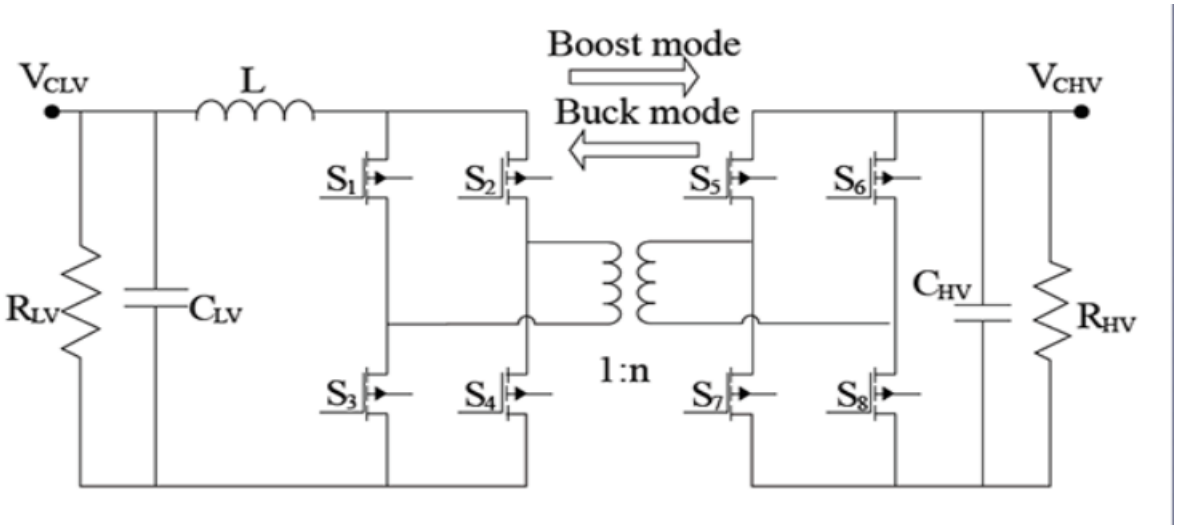
What is the Power Converter used in the circuit?



What is the Power Converter in the following Circuit?

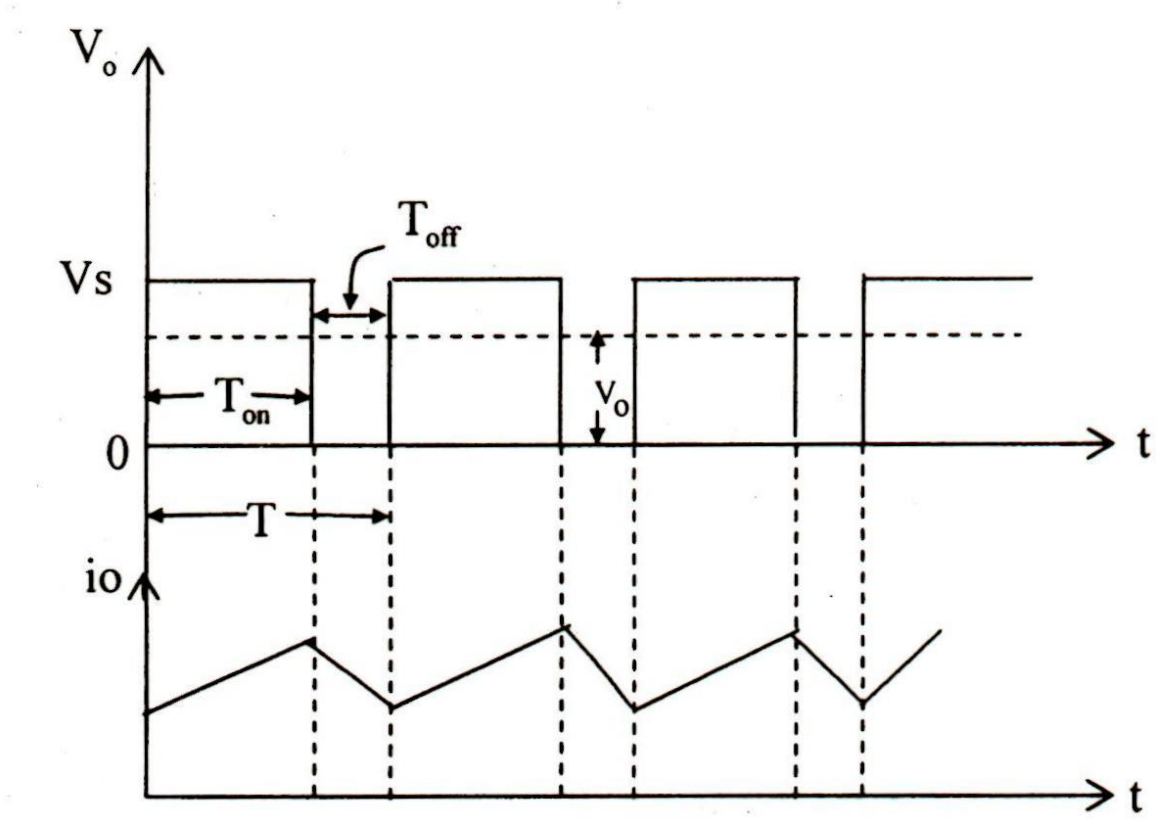


What is the conversion happening in the below converter?

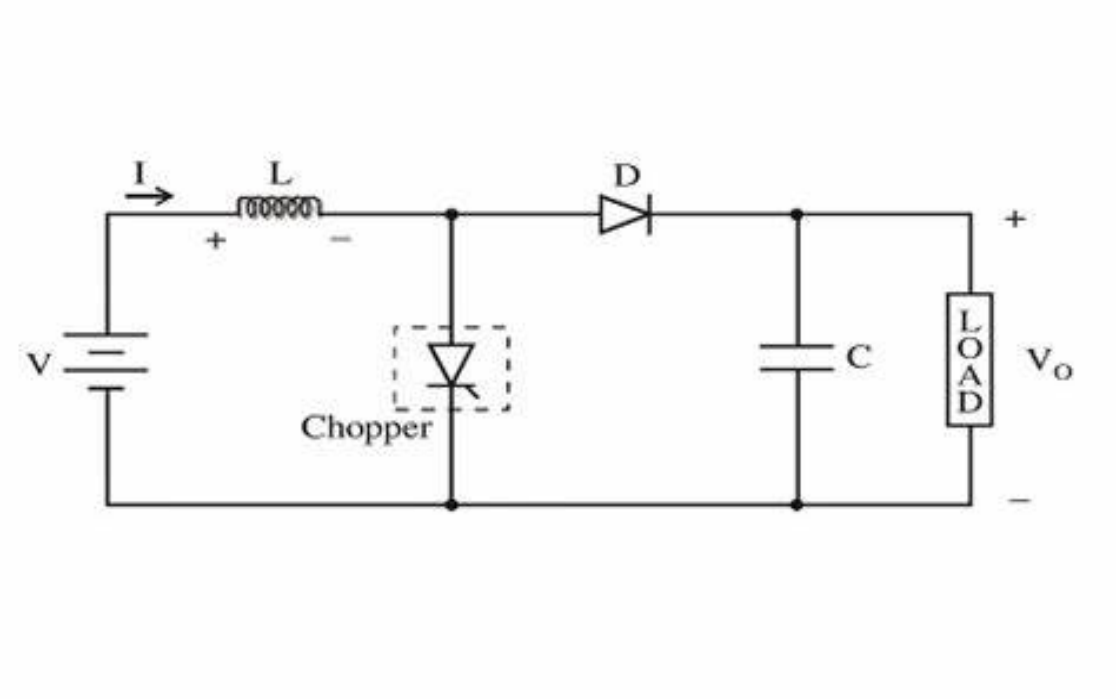


Illustrate Circuits used for the below Converter operations.

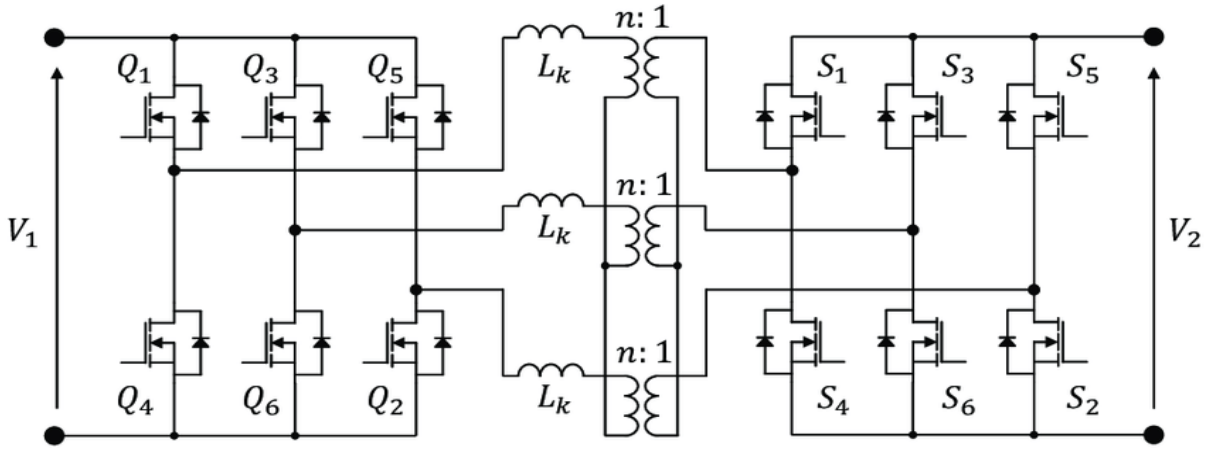
Draw the circuit diagram of the circuit which may give out the following voltage and current waveforms



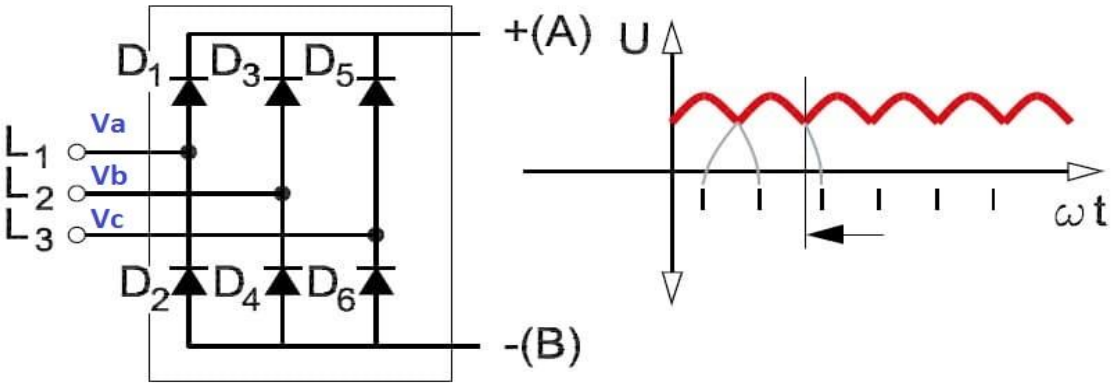
Identify the chopper in the following circuit.



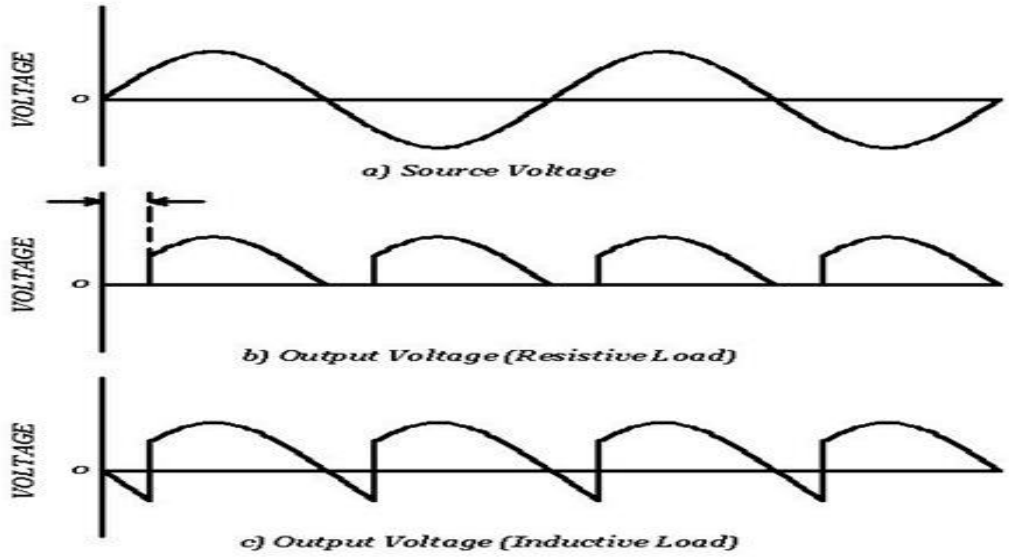
What is the circuit shown below? Identify the conversions happening.



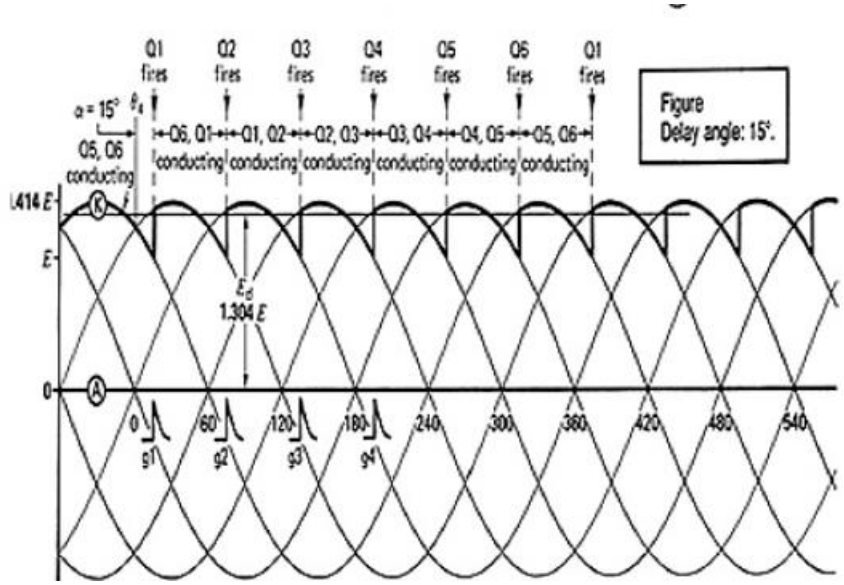
Identify the operation of the following circuit.



Draw the circuit which can give out the following waveforms



Identify the circuit of which gives the following outputs



Outcome: This activity helps the students to remember the block diagrams, circuits and also the concepts with means of pictures and block diagrams.

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DEPARTMENT :ELECTRICAL AND ELECTRONICS ENGINEERING

Innovative Teaching Methods-2022-23

Title of Innovative method/activity	**:**	**Google it–Report writing**
Name of the faculty	**:**	V. Vijaya Lakshmi
Designation	**:**	Assoc. Prof.
Course Name	**:**	Network Analysis

Objective of the Method:

Students are expected to Google the content of the topic available in open source. He/ She is also expected to go through, understand& explore beyond class room. Student will be reporting the concept understood in writing.

Aim of the method:

1. To maximize the learning experience.
2. To identify and prioritize content
3. To identify gaps in understanding

Implementation/Portrayal of method:

1. Use this opportunity to clear up any misconceptions
2. Student will be in a position to present the report prepared.
3. The report can be used for further reference.

Topic Covered through activity: Norton's Theorem

Description of the Method: students were asked to google about Norton theorem statement & procedure to apply the theorem for a given circuit. They were further asked to prepare a report accordingly.

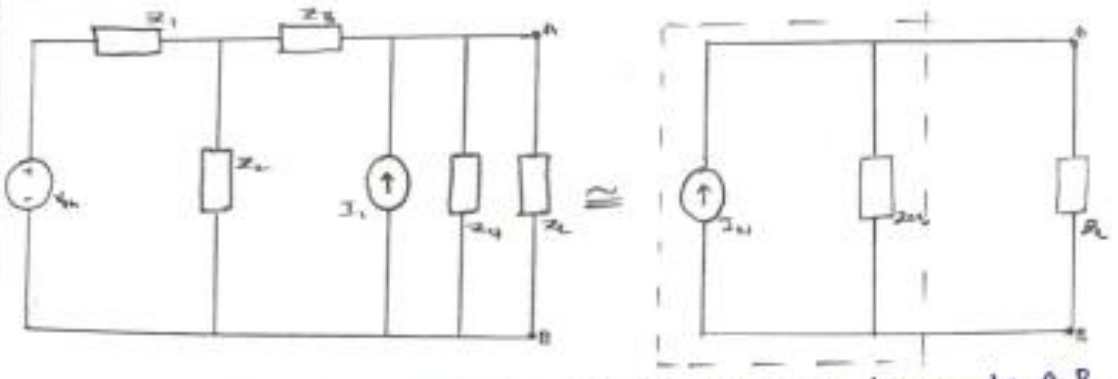
Benefits of the method: students understood how to apply Norton's theorem for a given circuit. This activity enhances communication and writing skills, it further engages the students in self learning.

Norton's theorem:

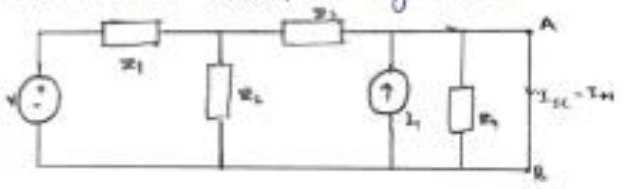
Statement: Any combination of linear bilateral circuit elements and active sources, regardless of connection or complexity, connected to a given load Z_L, can be replaced by a simple two terminal network, consisting a single current source of I_N ampers and a single impedance Z_{eq} in parallel with it, across the two-terminal of the load Z_L. the I_N is the short circuit current flowing through the short circuited path replaced instead of Z_L. It is also called Norton's current. the Z_{eq} is the equivalent impedance of the given network as viewed through the load terminals, with Z_L removed and all the active sources are replaced by short circuit while the independ current sources must be replaced by open circuit, while calculating Z_{eq}.

Explanation of Norton's theorem:

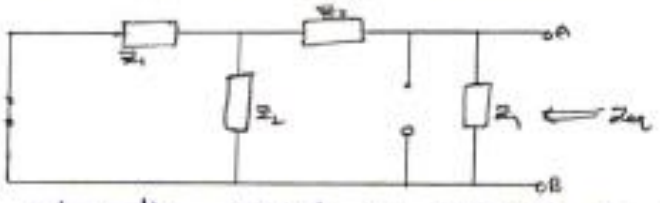
Consider a network shown in figure below. the terminals A-B are load terminals where load impedance Z_L is connected. According to Norton's theorem the entire network can be replaced by a current resource I_N, and an equivalent impedance Z_{eq} in parallel with it, across the load terminals A-B as shown in fig(b)



—for obtaining current I_{SC}. short the load terminals A.B. Calculate the current through the short circuited path by using any of the network amplification techniques this is Norton's current I_N. It is shown in fig below



while the equivalent impedance Z_{eq} is to be obtained by the same procedure as in case of thevinion's theorem.



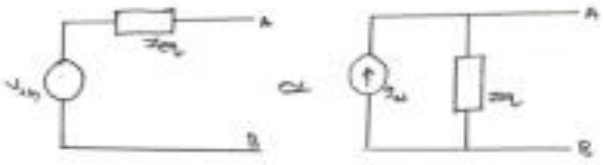
when the circuit is replaced by norton's equivalent across the load terminals, then the load current can be easily obtained by using current division in a parallel circuit as

$$I_L = I_N \cdot \frac{Z_{eq}}{Z_L + Z_{eq}}$$

—this theorem is also called dual of thevenin's theorem. This is because if the thevenin's equivalent voltage source is converted to an equivalent current source, the Norton's equivalent

is obtained. This is shown in fig.

-from source transformation we can write



$I_N = \frac{V_{th}}{Z_{eq}}$

or $Z_{eq} = \frac{V_{th}}{I_N}$

Steps to Apply Norton's theorem:

step-1 :- short the branch through which the current is to be calculated by removing the impedance between the terminals

step-2 :- obtain the current through this short circuited branch, using any of the network simplification techniques - this current is nothing but Norton's current I_N.

step-3 :- calculate the equivalent impedance Z_{eq} as viewed through the two terminals of interest by removing the branch impedance and making all the independent sources inactive

step-4 :- Draw the Norton's equivalent across the terminals of interest, showing a current source I_N with the impedance Z_{eq} parallel with it. Reconnect the branch impedance now let it be Z_L. the current through the branch of interest is

$$I = I_N \times \frac{Z_{eq}}{Z_{eq}+Z_L}$$

Note: If dependent sources are present in the circuit - then

$$Z_{eq} = \frac{V_{th}}{}$$

Outcome: Many students suggest that using the Google it-report writing strategy supported their ability to effectively explore and integrate the topic and create flow and linkage amongst when writing their report.

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