Name # Syed Daniyal Shah

ID # 15863

Assignment # Linear circuit Analysis

Date 01/10/2020

(a) Maximum Power Transfer Theorem.

Maximum power transfer theorem.

In electrical engineering, the maximum power transfer theorem state that, to obtain maximum external power from a source with a finite internal resistance, the resistance of the load must equal the resistance of the source as viewed from its output terminals. Moritz von jacobi published the maximum power (transfer) theorem around 1840. It is also referred to as "jacobi's law".

The theorem results in maximum power transfer across the circuit, and not maximum efficiency. If the resistance of the load is made larger than the resistance of the ~~load is made~~ Source then efficiency is higher, since a higher percentage of the source power is transfered to the load, but the magnitude of the load power is lower, since the total circuit resistance goes up.

If the load resistance is smaller than the source resistance is smaller than the source resistance then most of the power ends up being dissipated in the source, and although the total power dissipated is higher, due to a lower total resistance it turns out that the amount dissipated in the load is reduced.

The theorem states how to choose (so as to maximize power transfer) the load resistance once the source resistance is given. It is a common misconception to apply the theorem in the opposite scenario. It does not say how to choose the

Source resistance for a given load resistance. In fact, the source resistance that maximizes power transfer from a voltage source is always zero, regardless of the value of the load resistance.

In 2013, it was shown [3][4] that the fundamental mathematics of the maximum power theorem also applies to other physical situations, such as:

★ mechanical collisions between two objects,

★ the sharing of charge between two capacitors.

★ liquid flow between two cylinders.

★ the transmission and reflectio of light at the boundary between two media.

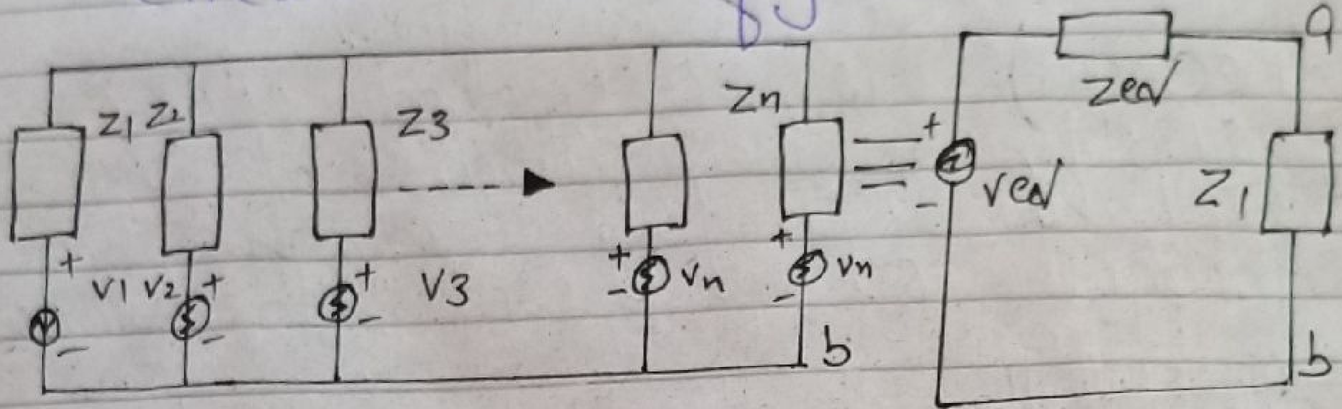
(b)

Millman's Theorem

In electrical engineering, Millman's theorem (or the parallel generator theorem) is a method to simplify the solution of a circuit. Specifically Millman's theorem is used to compute the voltage at the ends of a circuit made up of only branches in parallel. It is named after jacob Millman, who proved the theorem.

STATEMENT:

For AC network Millman's theorem state that "if "n" number of voltage sources $V_1, V_2, V_3 \ldots V_n$ having internal impendences $Z_1, Z_2, Z_3, \ldots Z_n$ are connected in parallel across the load Z_L than this arrangement may be replaced by a single voltage source veq in Series with equivalent impedence Zeq. Millman's equivalent circuit is fig. 1



$$veq = \frac{V1Y_1 + V_2Y_2 + V_3Y_3 ------ V_nY_n}{Y1 + Y_2 + Y_3 ------ Y_2} \quad (1)$$

$$Zeq = \frac{1}{Y1 + Y_2 + Y_3 ------ Y_2} \quad (2)$$

where $Z_1, Z_2, Z_3 ------ Z_n$ are impedence

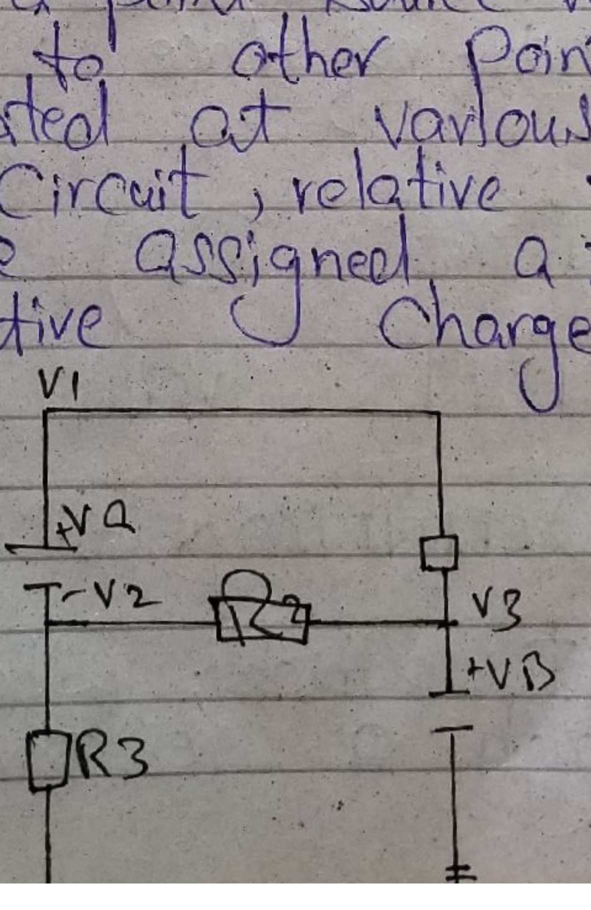
and $Y_1, Y_2, Y_3 ------ Y_n$ are the admitatances.

$$Y = \frac{1}{2}$$

This theorem is applicable only to solve the parallel branch with one impedence or resistance connected to voltage or current sources. The voltage sources can be converted into current sources by transformation of sources.

(C) Super Node :->

In circuit theory, a supernode is a theoretical construct that can be used to solve a curcuit. This is done by viewing a voltage source on a wire as a point source voltage in relation to other point voltages located at various nodes in the circuit, relative to a ground node assigned a zero or negative charge.



In the circuit, both VA and VB are supernodes. VA has two transferenced nodes, whereas VB has one referenced node (ground) and one unreferenced node.

Each supernode contains two nodes, one non-reference node and another node that may be a second non-reference node or the reference node. Supernodes containing the reference node ~~Supernodes containing~~ have one node voltage variable. For nodal Analysis the supernode construct is only required between two non-reference nodes.

(Part D)

d) RMS value :->

DEFINITION :-> That steady current which when flows through a resistor of known resistance for a given period of time than as a result the same quantity of heat is produced by the alternating current when flows through the same resistor for the same period of time is called R.M.S or effective value of the alternating currents.

In other words, the R.M.S value is defined as the square root of means of squares of instantaneous values.

(Part E)

e) Maximum value :->

Difinition :-> The maximum value attained by an alternating quantity during one

Cycle is called its Peak value. It is also known as the maximum value. The Sinusiodal alternating quantity obtains its Peak value at 90 degrees as Shown in the figure below.

The Peak values of alternating voltage and current is represented by Em and Im respectively.

(b) Active and Passive elements.

Introduction to electronic compontents : Active vs passive Components.

one key factor that differentiates types of electronic components from each other is whether they are passive or active. However, many people are unsure of exactly what that difference entails. This article is here to help.

The key difference between ative and passive components.

Electronic components are categorized as active or passive depending on the funtions they are able to perfrom. In a nutshell, active components can, generally speaking, inject power into a circuit and are capable of electrically controlling and amplifying the flow of electrical current, whereas passive components cannot.

unlike active components, passive components either consume or store energy. A simple way to test whether a components is ative or not is to measure the difference between its input and output signals. If there is a decline in power, the components it passivel. If the signal is amplified, it is active.

All electronic circuits must contai at last one active components, and most electronic devices contain both active and passive components.

Active Components and their fuctions

Active components reqaire a sou

of energy, typically in the from of a direct current, in order to perform their specific function. They are able to maniplulate the flow of electricity in some way. Most active components consist of semiconductor devices, such as diode, transistors and integrated circuits.

Passive components and their functions.

Passive components can influence the flow of electricity running through them.

For example:

they can resist its flow, store energy for later use, or produce inductance. However, they cannot control or amplify electricity themselves.

The most common components and their functions:

☆ Resistor: Resistor the flow of electrical current in a circuit; used to lower voltage.

☆ Capacitor: Store electrical energy electrostatically in an electric field (known as charging) and release it later when needed.