Sessional Assignment

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Course title; Linear circuit Anaylsis
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Q1: Briefly explain the following terms:

(a). Maximum Power Transfer Theorem.

Ans: The maximum power Transfer Theorem is not so much a means of anaylsis as it is an aid to System design. Simply stated, the maximum amount of power will be dissipated by a load resistance when that load resistance is equal to the Thevenin/Norton resistance of the network supplying the power.
If the load resistance is lower or higher than the Thevenin/Norton resistance of the source network, its dissipated power will be less than the maximum.
So in simple words
The Maximum power Transfer Theorem states that the maximum

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amount of power will be dissipated by a load resistance if it is equal to the Thevenin or Norton resistance of the network supplying power. The maximum power transfer theorem does not satisfy the goal of maximum efficiency.

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(B) Millman's Theorem.

Statement: For AC networks Millman's theorem states that "if 'n' number of voltage sources $V_1, V_2, V_3 \ldots V_n$ having internal impedances $Z_1, Z_2, Z_3 \ldots Z_n$ are connected in parallel across the load Z_l than this arrangement may be replaced by a single voltage source V_{eq} in series with equivalent impedance Z_{eq}. Millman's equivalent circuit is shown in fig. 1.

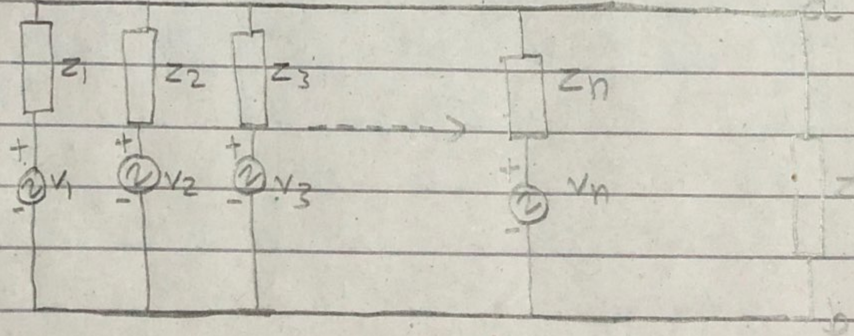

Fig 1a

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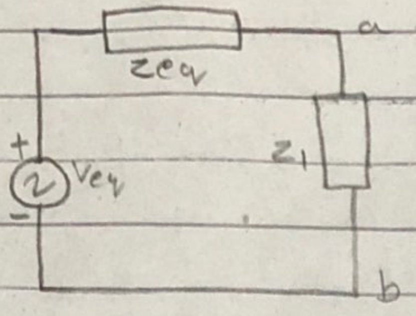

Fig 1b

Millman's Theorem For AC Networks

$$V_{eq} = \frac{V_1 Y_1 + V_2 Y_2 + V_3 Y_3 - - - - + V_n Y_n}{Y_1 + Y_2 + Y_3 - - - - - + Y_n} \quad ----(1)$$

$$Z_{eq} = \frac{1}{Y_1 + Y_2 + Y_3 - - - - - + Y_n} \quad -----(2)$$

where $Z_1, Z_2, Z_3 \ldots\ldots Z_n$ are the Impedances and $Y_1, Y_2, Y_3 \ldots\ldots Y_n$ are the admitatances.

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

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

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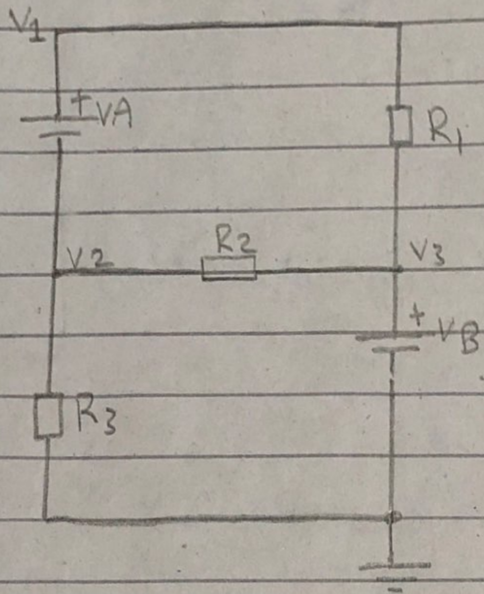
(C) Super Node.

In circuit theorey, a supernode is a thearetical construct that can be used to solve a circuit. 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 this circuit both VA and VB are supernodes VA has two unreferenced nodes, whereas VB has one referenced node (ground) and one unreferenced node.

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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 have one node voltage variable. For nodal anaylsis, the supernode construct is only required between two non-reference nodes.

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(D) RMS value.

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

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(e) Maximum value.

The maximum value attained by an alternating quantity during one cycle is called its Peak value. It is also known as the maximum value or amplitude or crest value. The sinusoidal alternating quantity obtains its peak value at 90 degrees as shown in the figure.

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

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(f) Active and Passive elements.

Active components

An active component is an electronic component which supplies energy to a circuit.

Common examples of active components include:

Voltage sources

current sources

Generators (such as alternators and DC generators)

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All different types of transistors
(such as bipolar junction transistors,
MOSFETS, FETs, and JFET)
Diodes (such as zener diodes, photodiodes,
Schottky diodes, and LEDs)

Passive components.
A passive component is an electronic component which can only receive energy, which it can either dissipate, absorb or store it in an electric field or a a magnetic field. Passive elements do not need any form of electrical power to operate.
As the name "passive" suggests passive devices do not provide gain or amplification. passive components cannot amplify, oscillate or generate an electrical signal.
Common examples of passive component include:
Resistors
Inductors
Capacitors
Transformers

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