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| Logo_MEC  **2019-2020**  **MUST KNOW CONCEPTS**  **EEE** | **MUTHAYAMMAL ENGINEERING COLLEGE**  **(An Autonomous Institution)**  **(Approved by AICTE, New Delhi, Accredited by NAAC & Affiliated to Anna University)**  **Rasipuram - 637 408, Namakkal Dist., Tamil Nadu** | **MKC** |

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| **Subject** | | | | **16EED02/ NETWORK ANALYSIS AND SYNTHESIS** | | | | | | |
| **S.No** | **Term** | | | **Notation**  **( Symbol)** | | | **Concept/Definition/Meaning/Units/Equation/Expression** | | **Units** | |
| **UNIT I NETWORK FUNCTIONS** | | | | | | | | | | |
|  | Classifications of circuit elements | | | - | Active Elements, Passive elements | | | | - | |
|  | Active elements | | | - | Deliver energy are called Active elements  Ex: Voltage and current sources | | | | - | |
|  | Passive Elements | | | - | Consume energy either by absorbing or storing Ex: Resistor, inductor and capacitors. | | | | - | |
|  | Lumped Elements | | | - | Physically separable elements | | | | - | |
|  | Distributed Elements | | | - | Not separable for electrical purpose. | | | | - | |
|  | Bilateral Elements | | | - | The voltage-current relation is same for current flowing in either direction. | | | | - | |
|  | Unilateral elements | | | - | The voltage-current relation is not same Example: Diode, Transistor. | | | | - | |
|  | Linear elements | | | - | Satisfies the current-voltage relationship.  Example: Resistor. | | | | - | |
|  | Non linear Elements | | | - | Does not satisfy the current-voltage relationship.  Example: Diode, Transistor. | | | | - | |
|  | Kirchoff’s current law | | | - | The algebraic sum of the current meeting at a junction is equal to zero. | | | | - | |
|  | Kirchoff’s voltage law | | | - | The algebraic sum of the voltages around any  closed path is zero | | | | - | |
|  | Maximum power transfer theorem | | | - | The maximum power delivered from source  to load at load R is equal to the source R. | | | | - | |
|  | Star Delta Transformation | | | - | The transformation of a given set of resistances in star to delta or vice versa | | | | - | |
|  | Network Function | | | - | The ratio of the complex amplitude of an  exponential output P(S) to the input Q(S) | | | | - | |
|  | Resonant Frequency | | | - | At resonant Condition Xl=Xc available frequency | | | | - | |
|  | Series Resonance | | | - | A resonance occurs in RLC series circuit called series resonance. | | | | - | |
|  | Quality factor | | | - | The ratio of maximum energy stored to the energy dissipated in one period | | | | - | |
|  | Selectivity | | | - | The ratio of bandwidth and resonant frequency | | | | - | |
|  | Bandwidth | | | - | Within the limits of lower and upper half frequency is called bandwidth. | | | | - | |
|  | Coupled Circuits | | | - | When two or more coils are linked by magnetic flux, | | | | - | |
|  | Complex impedance | | | - | The impedance of a two-terminal circuit element is represented as a [complex](https://en.wikipedia.org/wiki/Complex_number) quantity {\displaystyle \scriptstyle Z} | | | | - | |
|  | Complex admittance | | | - | The reciprocal [complex](https://en.wikipedia.org/wiki/Complex_number) impedance{\displaystyle \scriptstyle Z} | | | | - | |
|  | Concept of poles and zeros | | | - | Poles and Zeros of a transfer function denominator and numerator becomes zero respectively | | | | - | |
|  | Transfer Functions | | | - | The ratio of [Laplace Transform](https://www.electrical4u.com/laplace-transformation/), of output to the input | | | | - | |
|  | Time response | | | - | The output of a system when subjected to an input which is a function of time. | | | | - | |
| **UNIT 2**  **TWO PORT NETWORKS** | | | | | | | | | | |
|  | Ohm’s law | | | - | | Current is directly proportional to the potential difference at the temperature remains constant. | | | | - |
|  | Mesh | | | - | | loop which does not contain any other loops within it | | | | - |
|  | Source transformation | | | - | | The voltage and current sources may be interchanged without affecting the circuit; | | | | - |
|  | Phasor diagram | | | - | | complex plane showing the relationships of the specific circuits | | | | - |
|  | Thevenin’s theorem | | | - | | All circuit elements replaced by single voltage source in a series with a resistance | | | | - |
|  | Driving Point Impedance | | | - | The complex ratio of applied alternating voltage to the resulting alternating current | | | | - | |
|  | One-port network theory | | | - | The one-port is a ``black box'' with a single pair of input/output terminals | | | | - | |
|  | Port in a circuit | | | - | Port is a pair of terminals connecting an electrical network | | | | - | |
|  | Reciprocal network | | | - | A network by which the power losses are the same between any two ports | | | | - | |
|  | Two-Port Networks | | | - | A network with two input terminals and two output terminals is two-port-network | | | | - | |
|  | Passive network | | | - | One which contains no energy source | | | | - | |
|  | Active network | | | - | One which contains at least one independent type energy | | | | - | |
|  | Driving point impedance | | | - | The Laplace transform the input port voltages, port currents | | | | - | |
|  | Applications of z and y parameters | | | - | These parameters are used to describe the electrical behavior of linear electrical networks | | | | - | |
|  | Open circuit impedance parameters | | | - | Z-parameters are also known as open-circuit impedance parameters | | | | - | |
|  | Y parameter in two port network | | | - | Relationship between the port voltages, port currents | | | | - | |
|  | Symmetric Network | | | - | A network is symmetrical if its input impedance is equal to its output impedance | | | | - | |
|  | Reciprocity | | | - | Exchanging voltage and current results in an equivalent definition of reciprocity. | | | | - | |
|  | Lossless network | | | - | A lossless network is one which contains no resistors or other dissipative elements. | | | | - | |
|  | Z-parameters | | | - | Open circuit impedance parameters | | | | - | |
|  | Y-parameters | | | - | Short circuit admittance parameters | | | | - | |
|  | T-parameters or ABCD- parameters | | | - | Transmission or chain parameters | | | | - | |
|  | 0 T'-parameter | | | - | Inverse transmission parameters | | | | - | |
|  | H-parameters | | | - | Hybrid parameters | | | | - | |
|  | G-parameters | | | - | Inverse hybrid parameters | | | | - | |
| **UNIT 3 INTERCONNECTION OF NETWORKS** | | | | | | | | | | |
|  | Electrical network | | - | | An electrical network is an interconnection of [electrical components](https://en.wikipedia.org/wiki/Electronic_component) | | | | - | |
|  | Transfer [voltage ratio](https://www.electrical4u.com/voltage-and-turn-ratio-test-of-transformer/) function | | - | | The ratio of Transfer function output voltage to the input | | | | - | |
|  | Transfer current ratio function | | - | | The ratio of Transfer function output current to the input | | | | - | |
|  | Transfer impedance function | | - | | The ratio of Transfer function input voltage to the output current | | | | - | |
|  | Transfer admittance function | | - | | The ratio of Transfer function input current to the output voltage | | | | - | |
|  | Series Circuit | | - | | When all [elements of a circuit](https://www.electrical4u.com/active-and-passive-elements-of-electrical-circuit/) are connected one after another | | | | - | |
|  | Node | | - | | The end point of the branch where other branches meet is called a node. | | | | - | |
|  | Ladder Network. | | - | | A network consisting of circuit elements connected in series and in parallel. | | | | - | |
|  | Lattice Network | | - | | One of the common four-terminal two-port networks is the lattice, or bridge network | | | | - | |
|  | Synthesis | | - | | When the excitation and the response are given, and it is required to determine a network | | | | - | |
|  | Analysis | | - | | If the network and the excitation are given and the response is to be determined. | | | | - | |
|  | Series Resonance | | - | | The circuit is said to be resonant when the resultant reactance is zero in series RLC circuit | | | | - | |
|  | Periodic functions | | - | | A periodic function is that which repeats itself after regular intervals of time | | | | - | |
|  | Series Connection | | - | | Series connection of two-port networks N a and N b. interconnected | | | | - | |
|  | parallel connection | | - | | Parallel connection of two two-port networks N a and N b. interconnected. | | | | - | |
|  | T Representation. | | - | | Network element are connected in T form | | | | - | |
|  | Representation | | - | | Network element are connected in form | | | | - | |
|  | Symmetrical network | | - | | Unaffected even after interchanging of input and outputs | | | | - | |
|  | Asymmetrical network | | - | | Affected outputs when interchanging of input and outputs terminals | | | | - | |
|  | Characteristic impedance | | - | | Its measured first terminals of the cascade network | | | | - | |
|  | Asymmetrical network impedances | | - | | Iterative impedance, image impedance and image transfer constant | | | | - | |
|  | Image transfer constant | | - | |  | | | | - | |
|  | Image attenuation constant | | - | | Real part of image transfer constant | | | | - | |
|  | Image phase constant | | - | | Imaginary part of image transfer constant | | | | - | |
|  | Insertion loss | | - | | The loss in power delivered to the load by insertion of the network | | | | - | |
| **UNIT 4 FILTERS** | | | | | | | | | | |
|  | Ideal filter | | - | | Anideal filter characteristic passes a finite block of frequencies | | | | - | |
|  | Low pass filter | | LPF | | This filter passes the lower range of frequencies and stops higher range of frequencies | | | | - | |
|  | High pass  filter | | HPF | | This filter passes the higher frequencies and stops or filter out lower frequencies. | | | | - | |
|  | Band stop  filter | | BSF | | This filter stops band of frequencies from F1 to F2 | | | | - | |
|  | Band pass  filter | | BPS | | This filter passes band of frequencies. frequencies between F1 and F2. | | | | - | |
|  | Attenuation and phase shift | | - | | A propagation measurement is made by taking the difference between the phases (phase shift) | | | | - | |
|  | Attenuation | | - | | Increases as a function of increasing conductivity, | | | | - | |
|  | Application of low pass filter | | - | | Low pass filter most of the noise is removed and a clear sound is produced. | | | | - | |
|  | Integrator | | - | | The integrator is like the low pass filter in that it attenuates frequencies more the higher | | | | - | |
|  | Filter | |  | | Used to prevent 'unwanted' items from entering into your system | | | | - | |
|  | Filters applications | | - | | Power supplies, audio electronics, and radio communications | | | | - | |
|  | Low cutoff frequency | | - | | Corner frequency is the frequency either above or below which the power output of a circuit | | | | - | |
|  | 3dB frequency | | - | | The 3dB point, or 3dB frequency, is the point at which the signal has been attenuated by 3dB. | | | | - | |
|  | Active filter | | - | | Filter using active components | | | | - | |
|  | Amplitude Control Circuit | | ACC | | The Amplitude Control Circuit has to amplify the signal when the amplitude of the signal is below a reference value and attenuate the signal. | | | | - | |
|  | Cut off frequency | | - | | Frequency where the filter passes from pass band to attenuation band and is denoted by fc | | | | - | |
|  | Active filter | | - | | Active filters require an external power supply, | | | | - | |
|  | Passive filter | | - | | Operate only on the signal input | | | | - | |
|  | Pass band gain | | - | | The pass band gain of a filter is simply the amplification factor for signal components. | | | | - | |
|  | Slew rate | | - | | Change of voltage or current, or any other electrical quantity, per unit of time | | | | - | |
|  | Band-pass | | - | | The centre frequency fc, centre frequency gain, and the selectivity or Q. | | | | - | |
|  | All pass filter | | - | | Filter passes all the frequency components at constant gain | | | | - | |
|  | Narrow band pass | | - | | Specific values of centre frequency fc and Q or fc and BW. | | | | - | |
|  | Active Band Pass Filter | | - | | Cut-off frequency and continues up to infinity or the maximum open loop gain for an active filter. | | | | - | |
|  | Bands pass response. | | - | | The characteristics of the filter circuit with the curve. | | | | - | |
| **UNIT 5 ELEMENTS OF NETWORK SYNTHESIS** | | | | | | | | | | |
|  | One port network | - | | | Two terminal electrical network in which, current enters through one terminal and leave another | | | | - | |
|  | Two port Network | - | | | Pair of two terminal electrical network in which, current enters & leaves of each pair of ports. | | | | - | |
|  | Hurwitz polynomial. | - | | | stability criteria are fulfilled then the denominator of the F(s) | | | | - | |
|  | Control system | - | | | A control system manages commands, directs, or regulates the behavior of other devices | | | | - | |
|  | Driving-point function | - | | | A special type of transfer function in which the input , output variables are voltages or currents | | | | - | |
|  | Network, | - | | | A network, in the context of electronics, is a collection of interconnected components. | | | | - | |
|  | Real functions | - | | | Positive-real functions, often abbreviated to PR function or PRF | | | | - | |
|  | Positive real function | - | | | Two necessary and sufficient conditions for the functions to be a positive real function | | | | - | |
|  | T and Pi network | - | | | Any pi network can be transformed to an equivalent T network. | | | | - | |
|  | Resonant circuit | - | | | A resonant circuit (series or parallel) must have an inductive and a capacitive element. | | | | - | |
|  | Quality factor | Q | | | The ratio of the reactive power of either the inductor. | | | | - | |
|  | Real flux density | ZT | | | Plot the magnitude of the current I=E/ZT versus frequency for a fixed applied voltage E. | | | | - | |
|  | Loop and node | - | | | Preferably all current sources are transformed to voltage sources. | | | | - | |
|  | Node Analysis | - | | | Phasor-domain circuits is similar to nodal analysis for dc circuits. | | | | - | |
|  | Final value theorem | FVT | | | The time domain behavior as time approaches infinity. | | | | - | |
|  | Convolution Integral | - | | | Convolution of f and g is written f∗g, using an asterisk or star. | | | | - | |
|  | Series and parallel Elements | - | | | Network independently before tying them together in series-parallel combinations. | | | | - | |
|  | Superposition Theorem | - | | | The algebraic sum of the currents or voltages produced independently by each source. | | | | - | |
|  | Reciprocity Theorem | - | | | Theorem employed in the analysis of multisource networks described thus far | | | | - | |
|  | Thevenin’s Theorem | - | | | Equivalent circuit consisting of a voltage source and a series resistor | | | | - | |
|  | Norton’s Theorem | - | | | Equivalent circuit consisting of a current source and a parallel resistor. | | | | - | |
|  | System Poles and Zeros | - | | | As defined, the transfer function is a rational function in the complex variable s = σ + jω | | | | - | |
|  | System Stability | - | | | Linear system may be determined directly from its transfer function | | | | - | |
|  | Two port network | - | | | Two-terminal devices or elements (such as resistors, capacitors, and inductors) | | | | - | |
|  | Impedance parameters | - | | | Impedance-matching networks and power distribution networks. | | | | - | |
| **PLACEMENT QUESTIONS** | | | | | | | | | | |
|  | Analysis | - | | | | | | Analysis of a system is the investigation of properties and the behavior (response) of an existing system. | - | |
|  | Design | - | | | | | | A system is the choice and arrangement of system components to perform a specific task | - | |
|  | Design by analysis | - | | | | | | Accomplished by modifying the characteristics of an existing system | - | |
|  | Design by synthesis | - | | | | | | Accomplished by defining the form of the system directly from its specifications | - | |
|  | Synthesis | - | | | | | | Finding a network corresponding to a given driving-point impedance or admittance. | - | |
|  | Linear network | - | | | | | | An electric circuit in which circuit parameters are constant | - | |
|  | Nonlinear network | - | | | | | | An electric circuit whose parameters are varied | - | |
|  | Ohm's law used | - | | | | | | Calculate the relationship between voltage, current and resistance in an electrical circuit. | - | |
|  | Network in circuit theory | - | | | | | | In electrical engineering, Network Theory is the study of how to solve circuit problems. | - | |
|  | Non-linear Elements | - | | | | | | Transistors, vacuum tubes, other semiconductor devices, and transformers | - | |
|  | Linear elements | - | | | | | | Resistor is the most common element, capacitor, and air core inductors. | - | |
|  | Linear loads | - | | | | | | Resistive, capacitive, or inductive, but the impedance must remain fixed | - | |
|  | Driving point impedance | - | | | | | | The complex ratio of applied alternating voltage to the resulting alternating current | - | |
|  | Network theorems | - | | | | | | Electric circuit theorems are always beneficial to help find voltage and currents in multi loops. | - | |
|  | Z parameters | - | | | | | | Input voltage and current & output voltage and current of the two-port network | - | |
|  | Harmonics | - | | | | | | Distortion of a sinusoidal waveform by waveforms of different frequencies. | - | |
|  | Discovered power | - | | | | | | Benjamin Franklin for discovering electricity | - | |
|  | Circuit Theorem | - | | | | | | Allows us to replace part of a circuit by a current source and parallel resistor | - | |
|  | Reciprocal network | - | | | | | | The power losses are the same between any two ports | - | |
|  | Parameter in circuit | - | | | | | | Schematic level variables that can then be easily modified to match homework | - | |
|  | Father of the electricity | - | | | | | | Michael Faraday | - | |
|  | Types of electricity | - | | | | | | Static Electricity and Current Electricity | - | |
|  | 3 elements of electricity | - | | | | | | Resistance ,inductance, and Capacitance | - | |
|  | DC | - | | | | | | Current only flows in one direction. | - | |
|  | AC | - | | | | | | Alternating Current (AC), changes direction periodically | - | |
| Faculty Prepared | | P.Manikandan, AP/EEE | | | | | | Signature | | |

**HOD**