INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

ELECTRONICS AND COMMUNICATION ENGINEERING

DEFINITIONS AND TERMINOLOGY

Course Name	:	**ELECTRICAL CIRCUIT**
Course Code	:	**AEEB03**
Program	:	**B.Tech**
Semester	:	**II**
Branch	:	**EEE, ECE**
Section	:	**ALL**
Academic Year	:	**2019– 2020**
Course Faculty	:	**A SRIKANTH, Assistant Professor, EEE**

OBJECTIVES:

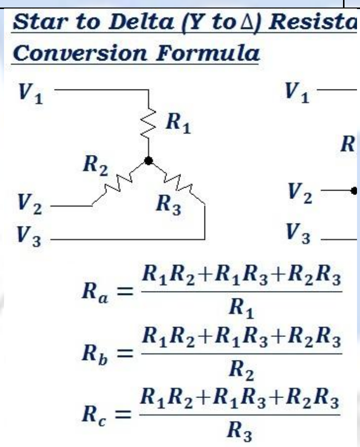
The course should enable the students to:

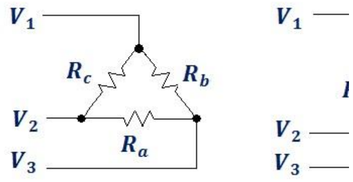
I	Classify circuit parameters and apply Kirchhoff‟s laws for network reduction.
II	Apply mesh analysis and nodal analysis to solve electrical networks.
III	Illustrate single phase AC circuits and apply steady state analysis to time varying circuits.
IV	Analyze electrical circuits with the help of network theorems.

DEFINITIONS AND TERMINOLOGYQUESTION BANK

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
UNIT-I (INTRODUCTION TO ELECTRICAL CIRCUITS)						
1	Define Voltage	Voltage,also calledelectromotiveforce, is a quantitative expression of the potential difference in charge between two points in an electrical field. Voltage is measured in Volts and represented by the letter 'V'	Remember	CO 1	CLO 2	AEEB03.02
2	Define flow of charge	Current is the rate at which an electric charge flows in a conductor. It is the number of electrons passing a given point in a second. This means that if more electrons pass by a given point, the current is greater. The symbol for current is the letter “I”. Electrical current is measured in Amperes or "amps".	Remember	CO 1	CLO 2	AEEB03.02
3	Define Power	The rate at which the work is being done in an electrical circuit is called an electric	Remember	CO 1	CLO 2	AEEB03.02

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		power. In other words, the electric power is defined as the rate of the transferred of energy. The electric power is produced by the generator and can also be supplied by the electrical batteries. It gives a low entropy form of energy which is carried over long distance and it is converted into various other forms of energy like motion, heat energy, etc..				
4	State Ohm's Law	Ohm's law states that the current through a conductor between two points is directly proportional to the potential difference across the two points. Introducing the constant of proportionality, the resistance, one arrives at the usual mathematical equation that describes this relationship:I=V/R	Understand	CO 1	CLO 3	AEEB03.03
5	State Kirchhoff's current Law	KCL or Kirchhoffs current law or Kirchhoffs first law states that the total current in a closed circuit, the entering current at node is equal to the current leaving at the node or the algebraic sum of current at node in an electronic circuit is equal to zero.	Understand	CO 1	CLO 3	AEEB03.03
6	State Kirchhoff's voltage Law	KVLor Kirchhoff's voltage law or Kirchhoffs secondlaw states that, the algebraic sum of the voltage in a closed circuit is equal to zero or the algebraic sum of the voltage at node is equal to zero. Hence, the sum ofthe voltage differences across all the elements in a circuit is always zero.	Understand	CO 1	CLO 3	AEEB03.03
7	Explain Energy Sources (Independent)	Independent sources are that which does not depend on any other quantity in the circuit. They are two terminal devices and has a constant value, i.e. the voltage across the two terminals remains constant irrespective of all circuit conditions. The strength of voltage or current is not changed by any variation in the connected network the source is said to be either independent voltage or independent current source.	Remember	CO 1	CLO 2	AEEB03.02

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		In this, the value of voltage or current is fixed and is not adjustable				
8	Explain Energy Sources (Dependent)	The sources whose output voltage or current is not fixed but depends on the voltage or current in another part of the circuit is called Dependent or Controlled source. They are four terminal devices. When the strength of voltage or current changes in the source for any change in the connected network, they are called dependent sources. The dependent sources are represented by a diamond shape. (VCVS, VCCS, CCCS, CCVS)	Remember	CO 1	CLO 2	AEEB03.02
9	Differentiate active and passive elements	Active components are those who delivers or produce energy or power in the form of a voltage or current. Active components can provide the power gain, whereas the passive components are not capable of providing the power gain. Passive elements include resistances, capacitors, and coils (also called inductors)	Remember	CO 1	CLO 2	AEEB03.07
10	Formula for Star to delta transformation		Understand	CO 1	CLO 4	AEEB03.04

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
11	Formula for delta to star transformation	***Delta to Star (Δ to Y) Resist*** ***Conversion Formula***  $R_1 = \frac{R_b R_c}{R_a + R_b + R_c}$ $R_2 = \frac{R_a R_c}{R_a + R_b + R_c}$ $R_3 = \frac{R_a R_b}{R_a + R_b + R_c}$	Understand	CO 1	CLO 4	AEEB03.04
12	Mesh analysis definition	Mesh analysis (or the mesh current method) is a method that is used to solve planar circuits for the currents (and indirectly the voltages) at any place in the electrical circuit. Planar circuits are circuits that can be drawn on a plane surface with no wirescrossing each other. A more general technique, called loop analysis (with the corresponding network variables called loop currents) can be applied to any circuit, planar or not. Mesh analysis and loop analysis both make use of Kirchhoff's voltage lawto arrive at a set of equations guaranteed to be solvable if the circuit has a solution.	Remember	CO 1	CLO 4	AEEB03.04
13	Nodal analysis definition	In electric circuits analysis, nodal analysis, node-voltage analysis, or the branch current method is a method of determining the voltage (potential difference) between "nodes" (points where elements or branches connect) in an electrical circuit in terms of the branch currents. In analyzing a circuit using Kirchhoff's circuit laws, one can either do nodal analysis using Kirchhoff's current law (KCL) Nodal analysis writes an equation at each electrical node, requiring that the branch currents incident at a node must sum to zero. The branch currents are written in terms of the circuit node	Remember	CO 1	CLO 4	AEEB03.04

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		voltages.				
14	Supermesh analysis definition	Super mesh is defined as the combination of two meshes which have current source on theirboundary. Super mesh Analysis is a better technique instead of using Mesh analysis to analysis such a complex electric circuit or network, where two meshes have a current source as a common element.	Remember	CO 1	CLO 4	AEEB03.04
15	Super node analysis definition	Super node circuit analysis instead of Node or Nodal circuit analysis to simplify such a network where the assign super node, fully enclosing the voltage source inside the super node and reducing the number of none reference nodes by one (1) for each voltage source.	Remember	CO 1	CLO 4	AEEB03.04
UNIT-II (AC CIRCUITS)						
1	State the sinusoidal alternating waveform	The term AC or to give it its full description of AlternatingCurrent, generally refers to a time-varying waveform with the most common of all being called a Sinusoid better known as a Sinusoidal Waveform. Sinusoidal waveforms are more generally called by their short description as Sine Waves.	Understand	CO 2	CLO 5	AEEB03.05
2	Main difference between ac and dc current	Alternating current describes the flow of charge that changes direction periodically. As a result, the voltage level also reverses along with the current. Direct current is a bit easier to understand than alternating current. Rather than oscillating back and forth, DC provides a constant voltage or current In direct current (DC), the electric charge (current) only flows in one direction. Electric charge inalternating current (AC), on the other hand, changes direction periodically. The voltage in ACcircuits also periodically reverses because thecurrent changes direction.	Remember	CO 2	CLO 5	AEEB03.05
3	Define peak value	Peak Value: The maximum value attained by an alternating quantity	Remember	CO 2	CLO 5	AEEB03.05

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		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				
4	Define average value	Average value: The average value is defined as "the average of all instantaneous values during one alternation". That is, the ratio of the sum of all considered instantaneous values to the number of instantaneous values in one alternation period.	Remember	CO 2	CLO 5	AEEB03.05
5	Define R.M.S value	RMS (Root Mean Square) value: The Root Mean Square (RMS) value is "the square root of the sum of squares of means of an alternating quantity".	Remember	CO 2	CLO 5	AEEB03.05
6	Define mean factor	The ratio of the root mean square value to the average value of an alternating quantity (current or voltage) is called Form Factor. The average of all the instantaneous values of current and voltage over one complete cycle is known as the average value of the alternating quantities.	Remember	CO 2	CLO 5	AEEB03.05
7	Define peak factor	Peak Factor is defined as the ratio of maximum value to the R.M.S value of an alternating quantity. The alternating quantities can be voltage or current. The maximum value is the peak value or the crest value or the amplitude of the voltage or current.	Remember	CO 2	CLO 5	AEEB03.05
8	Define reactive power	In electric power transmission and distribution, volt-ampere reactive (var) is a unit by which reactive power is expressed in an ACelectricpowersystem. Reactive power exists in an AC circuit when the current and voltage are not in phase. We know that reactive loads such as inductors and capacitors di ssipate zero power, yet the fact that they drop voltage and draw current	Remember	CO 2	CLO 5	AEEB03.05

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		gives the deceptive impression that they actually do dissipate power. This “phantom power” is called reactive power, and it is measured in a unit called Volt-Amps-Reactive (VAR), rather than watts. The mathematical symbol for reactive power is (unfortunately) the capital letter Q.				
9	Define real power	Active power does do work, so it is the real axis. The unit for all forms of power is the watt (symbol: W), but this unit is generally reserved for active power. Apparent power is conventionally expressed in volt-amperes (VA) since it is the product of rms voltage and rms current.The actual amount of power being used, or dissipated, in a circuit is called true power, and it is measured in watts (symbolized by the capital letter P, as always).	Remember	CO 2	CLO 5	AEEB03.05
10	Define apparent power	The combination of reactive power and true power is called apparent power, and it is the product of a circuit’s voltage and current, without reference to phase angle. Apparent power is measured in the unit of Volt-Amps (VA) and is symbolized by the capital letter S.	Remember	CO 2	CLO 5	AEEB03.05
11	Formulas for True, Reactive, and Apparent Power	**P** = true power $P = I^2R$ $P = \frac{E^2}{R}$ *Measured in units of* ***Watts*** **Q** = reactive power $Q = I^2X$ $Q = \frac{E^2}{X}$ *Measured in units of* ***Volt-Amps-Reactive (VAR)*** **S** = apparent power $S = I^2Z$ $S = \frac{E^2}{Z}$ $S = IE$ *Measured in units of* ***Volt-Amps (VA)***	Understand	CO 2	CLO 5	AEEB03.05
12	Explain the phasor representation	Phasor diagrams can be drawn to represent more than two sinusoids. They can be either voltage,current or some other alternating quantity but the frequency of all of them must be the same. Allphasors are drawn rotating in an anticlockwise direction. value of the	Understand	CO 2	CLO 5	AEEB03.05

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		sinusoidal quantity rather than its maximum value.				
13	Define Cosθ	Power Factor (Cosθ) – Cos fi or P.f – In electrical engineering, power factor is only and only related to AC circuits i.e. there is no power factor (P.f) in DC circuits due to zero frequency. The Cosine of angle between Current and Voltage is called Power Factor. P = VI Cosθ OR Cosθ = P / V I OR Cosθ=kW/kVA OR Cosθ = True Power/ Apparent Power	Understand	CO 2	CLO 6	AEEB03.06
14	Define total power	Complex Power. Complex power is "the complex sum of real and reactivepowers". It is also termed as apparent power, measured in terms of Volt Amps (or) in Kilo Volt Amps (kVA).	Remember	CO 2	CLO 6	AEEB03.06
15	Polar Form and Rectangular Form Notation for Complex Numbers	Polar form is where a complex number is denoted by the length (otherwise known as the magnitude, absolute value, or modulus) and the angle of its vector (usually denoted by an angle symbol that looks like this: ∠). Rectangular form, on the other hand, is where a complex number is denoted by its respective horizontal and vertical components. The angled vector is taken to be the hypotenuse of a right triangle, described by the lengths of the adjacent and opposite sides. Rather than describing a vector's length and direction by denoting magnitude and angle, it is described in terms of "how far left/right" and "how far up/down."	Remember	CO 2	CLO 6	AEEB03.06
UNIT-III (SINGLE PHASE AC CIRCUITS AND RESONANCE)						
1	State Faraday's laws	FIRST LAW. First Law of Faraday's Electromagnetic Induction state that whenever a conductorare placed in a varying magnetic field emf are induced which is	Understand	CO 3	CLO 9	AEEB03.09

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		calledinduced emf, if the conductor circuit are closed current are also induced whichiscalled in ducedcurrent.				
2	Fleming's right-hand rule	Fleming's right-hand rule gives which direction the current flows. The right hand is held with the thumb, index finger and middle finger mutually perpendicular to each other (at right angles), as shown in the diagram. The thumb is pointed in the direction of the motion of the conductor relative to the magnetic field.	Understand	CO 3	CLO 9	AEEB03.09
3	Explain dot convention rule	The convention is that current entering a transformer at the end of a winding marked with a dot, will tend to produce current exiting other windings at their dotted ends. Maintaining proper polarity is important in power system protection, measurement and control systems.	Remember	CO 3	CLO 9	AEEB03.01
4	Self and Mutual inductance definition	In the previous tutorial we saw that an inductor generates an induced emf within itself as a result of the changing magnetic field around its own turns. When this emf is induced in the same circuit in which the current is changing this effect is called Self-induction, (L). However, when the emf is induced into an adjacent coil situated within the same magnetic field, the emf is said to be induced magnetically, inductively or by Mutual induction, symbol (M). Then when two or more coils are magnetically linked together by a common magnetic flux they are said to have the property of Mutual Inductance.	Remember	CO 3	CLO 9	AEEB03.01
5	State Zero current theorem	Zero state response. In electrical circuit theory, the zero state response (ZSR), also known as the forced response is the behavior or response of a circuit with initialstate of zero. The ZSR results only from the external inputs or driving functions of	Remember	CO 3	CLO 10	AEEB03.10

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		the circuit and not from the initial state.				
6	StateTellegen"s theorem	Tellegen's theorem states that: In any electrical network which satisfies Kirchhoff's laws , the summation of instantaneous power in all the branches is equal to zero.	Remember	CO 3	CLO 10	AEEB03.10
7	Statesuperposition theorem	Superposition theorem states that in any linear, active, bilateral network having more than one source, the response across any element is the sum of the responses obtained from each source considered separately and all other sources are replaced by their internal resistance.The superposition theorem is used to solve the network where two or more sources are present and connected.	Remember	CO 3	CLO 10	AEEB03.10
8	Statereciprocity theorem	Reciprocity Theorem states that – In any branch of a network or circuit, the current due to a single source of voltage (V) in the network is equal to the current through that branch in which the source was originally placed when the source is again put in the branch in which the current was originally obtained.	Remember	CO 3	CLO 10	AEEB03.10
9	Statevoltage shift theorem	Shifting of Voltage Source (V-Shift) Consider the case where we need to apply voltage-to-current source transformation for a network which has a single voltage source connected to a couple of impedances. Figure 1a shows such a node, a, at which the positive terminal of the voltage source, V, is connected to a couple of impedances: Z1 to Z4. Here we can't transform the voltage source, V, as it has no impedance in series with it. However, we can push this voltage source through the node, a, towards the individual branches of the network. But while doing so, we have to take care that the current distribution through the circuit remains unaffected. Figure 1b shows the resultant	Remember	CO 3	CLO 10	AEEB03.10

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		circuit obtained by the push through mechanism of the voltage source. At this instant, we observe that, after V-shift, the voltage source is made to appear at every branch of the electrical network in series with the impedances present in each of them.				
10	StateThevinin‟s theorem	In electrical circuit theory, Thevenin's theorem for linear electrical networks states that any combination of voltage sources, current sources and resistors with two terminals is electrically equivalent to a single voltage source V and a single series resistor R.	Remember	CO 3	CLO 11	AEEB03.11
11	StateNorton‟s theorem	Norton's Theorem states that it is possible to simplify any linear circuit, no matter how complex, to anequivalent circuit with just a single current source andparallel resistance connected to a load	Remember	CO 3	CLO 11	AEEB03.11
12	Statemaximum power transfer theorem	The maximum power transfer theorem states that the maximum amount of power will be delivered to the load resistance when the load resistance is equal to the Thevenin /Norton resistance of the network supplying the power.	Remember	CO 3	CLO 10	AEEB03.10
13	StateMilliman‟s theorem	The Millman's Theorem states that – when a number of voltage sources (V1, V2, V3……… Vn) are in parallel having internal resistance (R1, R2, R3………….Rn) respectively, the arrangement can replace by a single equivalent voltage source V in series with an equivalent series resistance R. In other words; it determines the voltage across the parallel branches of the circuit, which have more than one voltage sources, i.e., reduces the complexity of the electrical circuit.	Remember	CO 3	CLO 11	AEEB03.11
14	Statecompensation theorems theorem	In Compensation Theorem, the source voltage (VC) opposes the original current.	Remember	CO 3	CLO 10	AEEB03.10

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		Insimple wordscompensationtheorem can be stated as – the resistance of any network can be replaced by a voltage source, having the same voltage as the voltage drop across the resistance which is replaced.				
15	Define synchronous vibration.	resonance: In an electrical circuit, the condition that exists when the inductive reactance and the capacitive reactance are of equal magnitude, causingelectrical energy to oscillate between the magnetic field of the inductor and the electric field of the capacitor.	Remember	CO 3	CLO 08	AEEB03.08
UNIT-IV (MAGNETIC CIRCUITS)						
1	What do you mean by transients?	Sudden change in the system conditions from its steady state.	Remember	CO 4	CLO 12	AEEB03.12
2	What is meant by first order system?	The system which has transfer function in the form of a first order differential equation is called first order system.	Remember	CO 4	CLO 12	AEEB03.12
3	What is meant by second order system?	The system which has transfer function in the form of a second order differential equation is called second order system.	Remember	CO 4	CLO 12	AEEB03.12
4	What is a series circuit?	A series circuit is a circuit in which the same current flows through the closed path.	Understand	CO 4	CLO 12	AEEB03.12
5	Define transfer function of a system	The ratio of response to input is called transfer function.	Remember	CO 4	CLO 13	AEEB03.13
6	Explain Laplace transform approach	Laplace transform approach is an approach to solve linear differential equations which takes into consideration the initial conditions of the circuit elements.	Remember	CO 4	CLO 13	AEEB03.13
7	Define Steady State Response	steady-state response in Electrical Engineering. The poles and zeros will control the steady-state response at any given frequency. A steady-state response is the behavior ofacircuitaftera longtimewhen steady conditions have been reached after an external excitation	Remember	CO 4	CLO 12	AEEB03.12
8	Explain one port network	One port network consists of two terminals in which current enters oneterminal and leaves from the other terminal.	Remember	CO 5	CLO 14	AEEB03.14

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
9	Explain two port network	A two-port consists of four terminals in an electrical network. The network acts as a black box with only the four terminals available for connection.	Remember	CO 5	CLO 14	AEEB03.14
10	What do you mean by Z-parameters?	Z-parameters are open circuit impedance parameters obtained by open circuiting the terminals.	Remember	CO 5	CLO 14	AEEB03.14
11	What do you mean by Y-parameters?	Y-parameters are short circuit admittance parameters obtained by short circuiting the terminals.	Remember	CO 5	CLO 14	AEEB03.14
12	What do you mean by ABCD-parameters?	ABCD parameters are transmission parameters which gives the relation between the voltages and currents at the sending end with respect to receiving end voltages and currents	Remember	CO 5	CLO 14	AEEB03.14
13	What do you mean by h-parameters?	h- parameters are hybrid parameters which provides series connection at the input and parallel connection at the output.	Remember	CO 5	CLO 15	AEEB03.15
14	Explain the concept of reciprocity in two port networks	The network is said to be reciprocal if the interchange of ideal voltage source at one port with an ideal current source at the other port does not change the ammeter reading.	Understand	CO 5	CLO 15	AEEB03.15
15	Explain the concept of symmetry in two port networks	A network is said to be symmetrical if the input and output ports can be interchanged without change in voltages and currents	Understand	CO 5	CLO 15	AEEB03.15
16	State Faraday's laws	FIRST LAW. First Law of Faraday's Electromagnetic Induction state that whenever a conductorare placed in a varying magnetic field emf are induced which is calledinduced emf, if the conductor circuit are closed current are also induced whichiscalled in ducedcurrent.	Understand	CO 3	CLO 9	AEEB03.09
17	Fleming's right-hand rule	Fleming's right-hand rule gives which direction the current flows. The right hand is held with the thumb, index finger and middle finger mutually perpendicular to each other (at right angles), as shown in the diagram. The thumb is pointed in the direction of the motion of the	Understand	CO 3	CLO 9	AEEB03.09

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		conductor relative to the magnetic field.				
18	Explain dot convention rule	The convention is that current entering a transformer at the end of a winding marked with a dot, will tend to produce current exiting other windings at their dotted ends. Maintaining proper polarity is important in power system protection, measurement and control systems.	Remember	CO 3	CLO 9	AEEB03.01
19	Self and Mutual inductance definition	In the previous tutorial we saw that an inductor generates an induced emf within itself as a result of the changing magnetic field around its own turns. When this emf is induced in the same circuit in which the current is changing this effect is called Self-induction, (L). However, when the emf is induced into an adjacent coil situated within the same magnetic field, the emf is said to be induced magnetically, inductively or by Mutual induction, symbol (M). Then when two or more coils are magnetically linked together by a common magnetic flux they are said to have the property of Mutual Inductance.	Remember	CO 3	CLO 9	AEEB03.01
20	State Zero current theorem	Zero state response. In electrical circuit theory, the zero state response (ZSR), also known as the forced response is the behavior or response of a circuit with initialstate of zero. The ZSR results only from the external inputs or driving functions of the circuit and not from the initial state.	Remember	CO 3	CLO 10	AEEB03.10
UNIT-V (NETWORK THEOREMS (DC AND AC)						
1	Explain one port network	One port network consists of two terminals in which current enters oneterminal and leaves from the other terminal.	Remember	CO 5	CLO 14	AEEB03.14
2	Explain two port network	A two-port consists of four terminals in an electrical network. The network acts as a black box with only the four terminals available for connection.	Remember	CO 5	CLO 14	AEEB03.14

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
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10	Fleming's right-hand rule	Fleming's right-hand rule gives which direction the current flows. The right hand is held with the thumb, index finger and middle finger mutually perpendicular to each other (at right angles), as shown in the diagram. The thumb is pointed in the direction of the motion of the conductor relative to the magnetic field.	Understand	CO 5	CLO 15	AEEB03.09
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		current exiting other windings at their dotted ends. Maintaining proper polarity is important in power system protection, measurement and control systems.				
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14	StateTellegen‟s theorem	Tellegen's theorem states that: In any electrical network which satisfies Kirchhoff's laws , the summation of instantaneous power in all the branches is equal to zero.	Remember	CO 5	CLO 15	AEEB03.10
15	Statesuperposition theorem	Superposition theorem states that in any linear, active, bilateral network having more than one source, the response across any element is the sum of the responses obtained from each source considered separately and all other sources are replaced by their internal resistance.The superposition theorem is used to solve the network where two or more sources are	Remember	CO 5	CLO 14	AEEB03.10

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		present and connected.				
16	Statereciprocity theorem	Reciprocity Theorem states that – In any branch of a network or circuit, the current due to a single source of voltage (V) in the network is equal to the current through that branch in which the source was originally placed when the source is again put in the branch in which the current was originally obtained.	Remember	CO 5	CLO 15	AEEB03.10
17	Statevoltage shift theorem	Shifting of Voltage Source (V-Shift) Consider the case where we need to apply voltage-to-current source transformation for a network which has a single voltage source connected to a couple of impedances. Figure 1a shows such a node, a, at which the positive terminal of the voltage source, V, is connected to a couple of impedances: Z1 to Z4. Here we can't transform the voltage source, V, as it has no impedance in series with it. However, we can push this voltage source through the node, a, towards the individual branches of the network. But while doing so, we have to take care that the current distribution through the circuit remains unaffected. Figure 1b shows the resultant circuit obtained by the push through mechanism of the voltage source. At this instant, we observe that, after V-shift, the voltage source is made to appear at every branch of the electrical network in series with the impedances present in each of them.	Remember	CO 5	CLO 15	AEEB03.10
18	StateThevenin‟s theorem	In electrical circuit theory, Thevenin's theorem for linear electrical networks states that any combination of voltage sources, current sources and resistors with two terminals is electrically equivalent to a single voltage source V and a single series resistor R.	Remember	CO 5	CLO 14	AEEB03.11

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
19	StateNorton"s theorem	Norton's Theorem states that it is possible to simplify any linear circuit, no matter how complex, to anequivalent circuit with just a single current source andparallel resistance connected to a load	Remember	CO 5	CLO 14	AEEB03.11
20	Statemaximum power transfer theorem	The maximum power transfer theorem states that the maximum amount of power will be delivered to the load resistance when the load resistance is equal to the Thevenin /Norton resistance of the network supplying the power.	Remember	CO 5	CLO 15	AEEB03.10
21	StateMilliman"s theorem	The Millman's Theorem states that – when a number of voltage sources (V1, V2, V3……… Vn) are in parallel having internal resistance (R1, R2, R3………….Rn) respectively, the arrangement can replace by a single equivalent voltage source V in series with an equivalent series resistance R. In other words; it determines the voltage across the parallel branches of the circuit, which have more than one voltage sources, i.e., reduces the complexity of the electrical circuit.	Remember	CO 5	CLO 15	AEEB03.11
22	Statecompensation theorems theorem	In Compensation Theorem, the source voltage (VC) opposes the original current. Insimple wordscompensationtheorem can be stated as – the resistance of any network can be replaced by a voltage source, having the same voltage as the voltage drop across the resistance which is replaced.	Remember	CO 5	CLO 14	AEEB03.10
23	Define synchronous vibrati.	resonance: In an electrical circuit, the condition that exists when the inductive reactance and the capacitive reactance are of equal magnitude, causingelectrical energy to oscillate between the magnetic field of the inductor and the electric field of the capacitor.	Remember	CO 5	CLO 14	AEEB03.08

Signature of the Faculty **HOD, ECE**