



# INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

## Department of Electrical and Electronics Engineering

### TUTORIAL QUESTION BANK

Course Name	:	ELECTRICAL CIRCUITS
Course Code	:	AEEB03
Class	:	B. Tech II Semester
Branch	:	EEE / ECE
Year	:	2019 – 2020
Course Coordinator	:	Mr.A.Srikanth, Assistant Professor, EEE
Course Instructors	:	Mr. A Naresh kumar, Assistant Professor, EEE Mr. T Mahesh , Assistant Professor, EEE Mr. K Lingaswamy, Assistant Professor, EEE

#### COURSE OBJECTIVES:

The course should enable the students to:

I	Classify circuit parameters and apply Kirchoff'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.

#### COURSE OUTCOMES (COs):

CO 1	Understand and analyze basic AC and DC electrical circuits.
CO 2	Apply mesh analysis and nodal analysis to solve electrical networks. Calculate the two port network parameters
CO 3	Illustrate single phase AC circuits and apply steady state analysis to time varying circuits.
CO 4	Understand the transient response of series and parallel RL, RC and RLC circuits for DC excitations.
CO 5	Understand the characteristics of complex electrical networks using DC and AC Theorems.

#### COURSE LEARNING OUTCOMES:

Students, who complete the course, will have demonstrated the ability to do the following:

S. No	Description
AEEB03.01	Define the various nomenclature used to study the characteristics of DC networks.
AEEB03.02	Understand the concept of circuit, classification of elements and types of energy sources.
AEEB03.03	State different laws associated with electrical circuits and apply source transformation technique to determine equivalent resistance and source current.
AEEB03.04	Apply the network reduction techniques directly.

<b>S. No</b>	<b>Description</b>
AEEB03.05	Indirectly to calculate quantities associated with electrical circuit.
AEEB03.06	Define the various nomenclature related with network topology and give the importance of dual network.
AEEB03.07	Identify the alternating quantities with it instantaneous, average and root mean square values.
AEEB03.08	Demonstrate the impression of reactance, susceptance, impedance and admittance in estimating power of AC circuits.
AEEB03.09	Demonstrate the concept of power, real, reactive and complex power, power factor of AC circuits.
AEEB03.10	Design the series and parallel RLC for the required bandwidth, resonant frequency and quality factor.
AEEB03.11	Analyze the steady state behavior of series and parallel RL, RC and RLC circuit with sinusoidal excitation.
AEEB03.12	Determine magnetic flux, reluctance, self and mutual inductance in the single coil and coupled coils magnetic circuits.
AEEB03.13	State the faraday's laws of electromagnetic induction used in construction of magnetic Circuit.
AEEB03.14	Summarize the procedure of thevenin's, norton's and milliman's theorems to reduce complex network into simple equivalent network.
AEEB03.15	Prove the law of conservation of energy, superposition principle, reciprocity and maximum power transfer condition for the electrical network with DC and AC excitation.

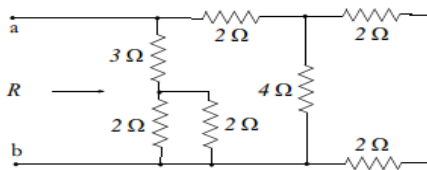
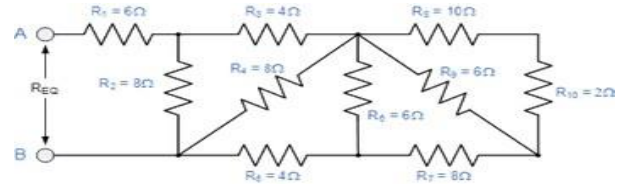
<b>S. NO</b>	<b>Question</b>	<b>Bloom's Taxonomy</b>	<b>Course Outcomes</b>	<b>Course Learning Outcome</b>
<b>UNIT - I</b>				
<b>INTRODUCTION TO ELECTRICAL CIRCUITS</b>				
<b>Part – A (Short Answer Questions)</b>				
1	Draw the basic electric circuit with proper labelling and write importance of each part.	Remember	CO 1	AEEB03.02
2	Define the potential difference.	Remember	CO 1	AEEB03.01
3	Define current.	Remember	CO 1	AEEB03.01
4	Write the expression for voltage in terms of C and Q.	Remember	CO 1	CEE002.01
5	State Ohm's law.	Remember	CO 1	AEEB03.03
6	State Kirchhoff's laws.	Remember	CO 1	AEEB03.03
7	Calculate equivalent resistance of the circuit, if applied voltage is 23V and current flowing through circuit is 4A, receiving an power of 92W.	Understand	CO 1	AEEB03.03
8	If the charge developed between two plates is 2C and capacitance is 4.5 F, determine voltage applied to the plates.	Understand	CO 1	AEEB03.01
9	If three capacitors are connected in series which are 2F, 3F and 6F. Calculate equivalent capacitance.	Understand	CO 1	AEEB03.03
10	If three inductors are in parallel with 20mH, 25mH and 50mH, determine the equivalent inductance.	Understand	CO 1	AEEB03.03
11	Deduce current source from voltage source using source transformation.	Understand	CO 1	AEEB03.03
12	Deduce voltage source from current source using source transformation.	Understand	CO 1	AEEB03.03
13	Across AB terminal, a voltage source of 25V is in series with 15 ohms resistor, apply source transformation and redraw the circuit across AB terminals.	Understand	CO 1	AEEB03.03
14	Compare between practical sources and ideal sources.	Remember	CO 1	AEEB03.02
15	Explain with relevant diagrams of dependent sources.	Understand	CO 1	AEEB03.02
16	State two salient points of a series combination of resistors.	Remember	CO 1	AEEB03.03

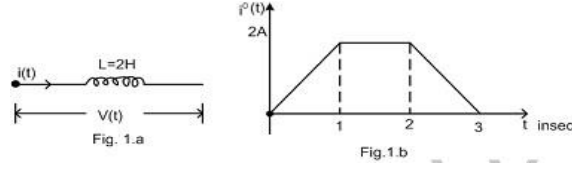
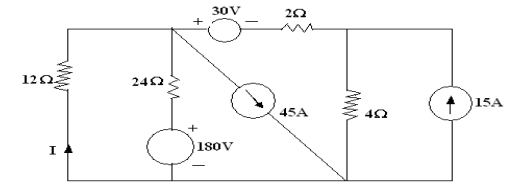
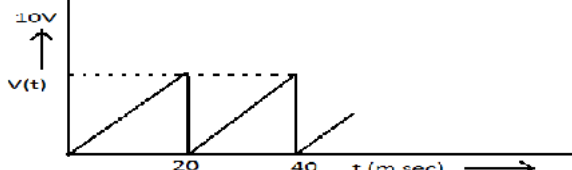
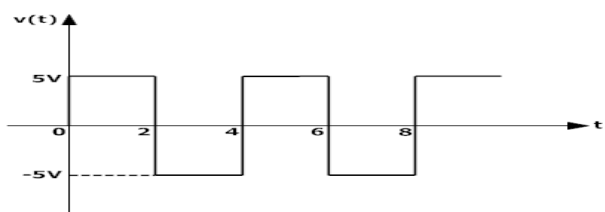
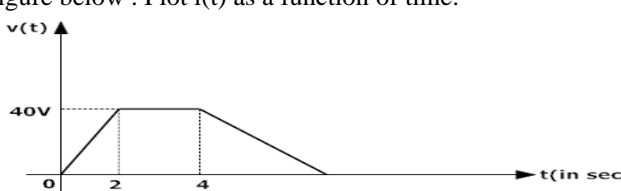
17	Define an ideal voltage source and current source.	Remember	CO 1	AEEB03.02
18	Write the expression of energy stored in a inductor and capacitor.	Remember	CO 1	AEEB03.02
19	State two salient points of parallel connections of resistors.	Remember	CO 1	AEEB03.03
20	Write the properties of inductor.	Remember	CO 1	AEEB03.02
21	Write the properties of capacitor.	Remember	CO 1	AEEB03.02
22	State limitations of ohm's law?	Remember	CO 1	AEEB03.3
23	Define conductance and state its unit	Remember	CO 1	AEEB03.1

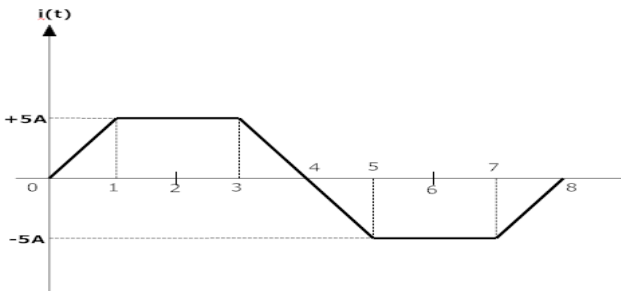
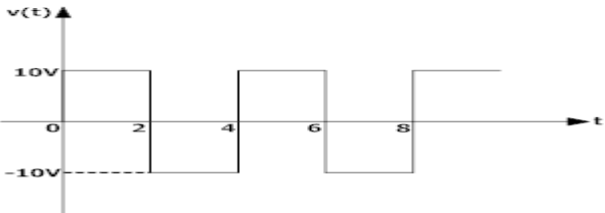
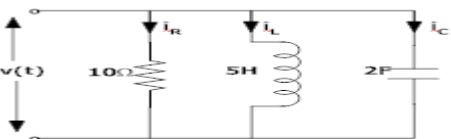
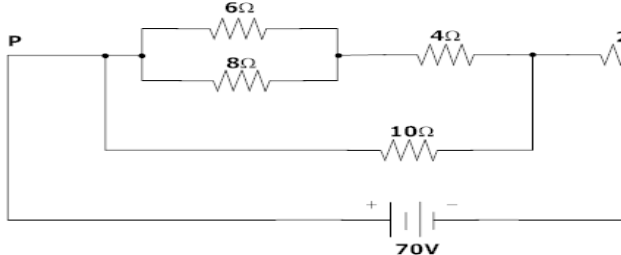
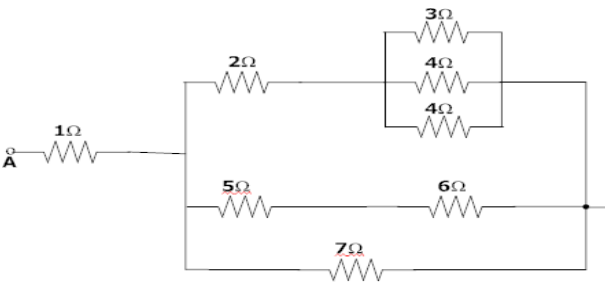
**PART - B (LONG ANSWER QUESTIONS)**

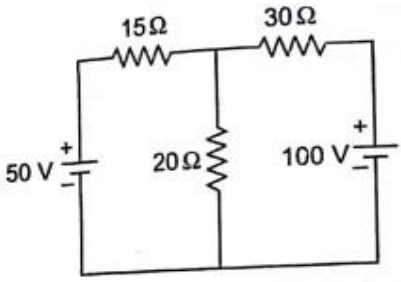
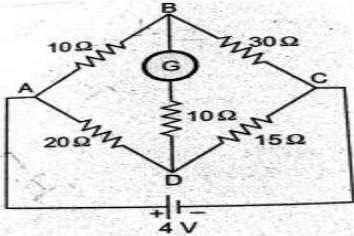
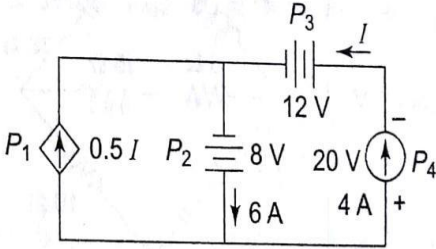
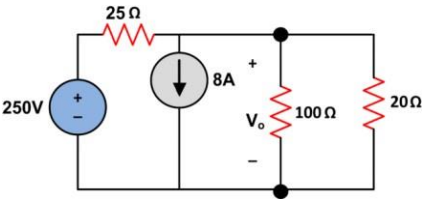
1	Differentiate resistor, inductor and capacitor elements using their voltage-current characteristics.	Remember	CO 1	AEEB03.02
2	Derive the necessary condition for source transformation and deduce one type of source from the other.	Remember	CO 1	AEEB03.03
3	Explain the laws used to study behaviour of the series and parallel circuits with neat examples.	Understand	CO 1	AEEB03.03
4	Classify types of electric circuit elements depending on their characteristics and explain in detail.	Understand	CO 1	AEEB03.02
5	Distinguish between ideal and practical energy sources.	Understand	CO 1	AEEB03.02
6	State ohm's law and give its applicability and to electrical network. Explain convention current direction and voltage across an element	understand	CO 1	AEEB03.03
7	Write the conventions to study any electrical circuit.	Understand	CO 1	AEEB03.02
8	Define the terms voltage, current, power, energy, node and degree of the node.	Remember	CO 1	AEEB03.01
9	Deduce voltage, current division rules for series, parallel circuits respectively and explain with neat example.	Understand	CO 1	AEEB03.03
10	Predict in detail the equivalent inductance of series and parallel connections of inductor elements.	Understand	CO 1	AEEB03.03
11	Estimate the equivalent capacitance of series and parallel connections of capacitor elements.	Understand	CO 1	AEEB03.03
12	Estimate the equivalent capacitance of series and parallel connections of resistor elements.	Understand	CO 1	AEEB03.03

**PART - C (ANALYTICAL QUESTIONS)**

1	<p>Calculate the equivalent resistance for the given circuit shown in figure below with step by step explanation?</p> 	Understand	CO 1	AEEB03.03
2	<p>Calculate equivalent resistance of circuit shown in figure below?</p> 	Understand	CO 1	AEEB03.03
3	<p>If three capacitors are 10F, 12F and 5F capacitance, Calculate the equivalent capacitance for series and parallel connection.</p>	Understand	CO 1	AEEB03.03
4	<p>Consider an coil allowing an current of <math>i(t) = 4t^2</math> for 1 ms, derive the voltage induced, power absorbed and energy stored by inductor, if its inductance is 5H.</p>	Understand	CO 1	AEEB03.03

5	<p>Consider an capacitor allowing an current of <math>v(t) = 4t^2 + 2t + 1</math>, deduce the expression for current flowing, power absorbed and energy stored by capacitor, if its capacitance is 5H.</p>	Understand	CO 1	AEEB03.03
6	<p>An inductor shown in fig1 (a) is supplied with a current wave from given in fig1(b) Draw the wave forms for voltage and energy in the inductor</p> 	Understand	CO 1	AEEB03.03
7	<p>Reduce the network shown in fig (2) to a single loop network by source transformation, to obtain the current in the 12Ω resistor.</p> 	Understand	CO 1	AEEB03.03
8	<p>A saw tooth voltage as shown in figure is applied to a capacitor of <math>C= 30\text{micro Farad}</math>. Determine the capacitor current.</p> 	Understand	CO 1	AEEB03.03
9	<p>If three inductors are connected in parallel having 100mH, 25mH and 35mH inductance respectively, calculate the equivalent inductance.</p>	Understand	CO 1	AEEB03.03
10	<p>The following voltage waveform is applied to an inductor of 2H. draw the waveform for current through an inductor as shown in figure below?</p> 	Understand	CO 1	AEEB03.03
11	<p>A 0.5μF capacitor has a voltage wave form v(t) as shown in figure below . Plot i(t) as a function of time.</p> 	Understand	CO 1	AEEB03.03

12	<p>The following current waveform <math>i(t)</math> is passed through a series RL circuit with <math>R=2\Omega</math> and <math>L=2mH</math>. Find the voltage across each element and sketch them.</p> 	Understand	CO 1	AEEB03.03
13	<p>For given parallel RLC circuit shown in the figure below Draw the waveforms for <math>i_R, i_L, i_C</math> for the circuit when it is excited by a voltage source as shown in the figure</p>  	Understand	CO 1	AEEB03.03
14	<p>Find the equivalent resistance of the circuit shown in the figure below and also calculate the source current, voltage drop across each element.</p> 	Understand	CO 1	AEEB03.03
15	<p>Determine equivalent resistance for the circuit shown in the figure?</p> 	Understand	CO 1	AEEB03.03
16	<p>If a piece of certain wire of 40m length and 0.07cm in radius has a resistance of 15ohm, find its specific resistance of material.</p>	Understand	CO 1	AEEB03.03
17	<p>A copper wire of diameter 1cm has resistance of 0.15ohm.it was drawn under pressure so that its diameter was reduced to 50%.what is the new resistance of the wire?</p>	Understand	CO 1	AEEB03.03

18	<p>By applying Kirchoff's law. Find the current through all the elements in the circuit shown in figure below?</p> 	Understand	CO 1	AEEB03.03
19	<p>By applying Kirchoff's law. Find the current through all the elements in the circuit shown in figure below?</p> 	Understand	CO 1	AEEB03.03
20	<p>Calculate power absorbed by each component for the circuit shown in figure below?</p> 	Understand	CO 1	AEEB03.03
21	<p>Find <math>V_o</math> using source Transformation</p> 	Understand	CO 1	AEEB03.03
22	<p>A platinum resistance thermometer uses the change in <math>R</math> to measure temperature. Suppose <math>R_0 = 50 \Omega</math> at <math>T_0 = 20^\circ \text{C}</math>. <math>\alpha</math> for Pt is <math>3.92 \times 10^{-3} (\text{C}^\circ)^{-1}</math> in this temperature range. What is <math>R</math> when <math>T = 50.0^\circ \text{C}</math>?</p>	Understand	CO 1	AEEB03.03
23	<p>A platinum resistance thermometer has a resistance <math>R_0 = 50.0 \Omega</math> at <math>T_0 = 20^\circ \text{C}</math>. <math>\alpha</math> for Pt is <math>3.92 \times 10^{-3} (\text{C}^\circ)^{-1}</math>. The thermometer is immersed in a vessel containing melting tin, at which point <math>R</math> increases to <math>91.6 \Omega</math>. What is the melting point of tin?</p>	Understand	CO 1	AEEB03.03
24	<p>A typical household incandescent light bulb is connected to a 120V outlet. The power output is 100 Watts. What's the current through the bulb? What's <math>R</math> of the filament?</p>	Understand	CO 1	AEEB03.03

**UNIT - II****ANALYSIS OF ELECTRICAL CIRCUITS****Part – A (Short Answer Questions)**

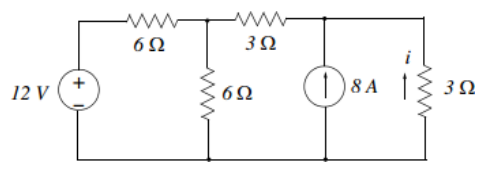
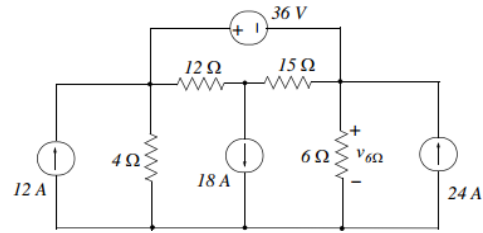
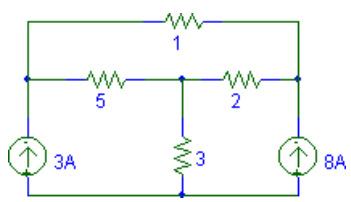
1	Write the expressions of star to delta transformation.	Remember	CO 2	AEEB03.04
2	Write the expressions of delta to star transformation.	Remember	CO 2	AEEB03.04
3	Define super mesh.	Remember	CO 2	AEEB03.04
4	Give the condition for super node.	Understand	CO 2	AEEB03.04
5	Write the limitations of mesh analysis.	Remember	CO 2	AEEB03.04
6	Write the limitations of nodal analysis.	Remember	CO 2	AEEB03.04
7	If three equal value resistors are in delta, determine their equivalent values in star connection.	Understand	CO 2	AEEB03.04
8	Define reference node.	Remember	CO 2	AEEB03.04
9	Give the difference between nodal analysis and mesh analysis	Understand	CO 2	AEEB03.04
10	If three equal value resistors are in star, calculate their equivalent values in delta connection.	Understand	CO 2	AEEB03.04
11	If three equal value resistors with $R=3\text{ohms}$ are in delta, determine their equivalent values in star connection.	Understand	CO 2	AEEB03.04
12	Define network topology and write its importance in electrical circuits.	Remember	CO 2	AEEB03.04
13	Define tree and co-tree.	Remember	CO 2	AEEB03.04
14	Write the expression for number of links.	Remember	CO 2	AEEB03.04
15	Give the importance and properties of incidence matrix.	Remember	CO 2	AEEB03.04
16	For 8 element 5 node graph, determine number of links.	Understand	CO 2	AEEB03.04
17	Define basic tie-set and give the condition to form basic tie-set.	Remember	CO 2	AEEB03.04
18	Define basic tie-set and give the condition to form basic cut-set.	Remember	CO 2	AEEB03.04
19	Define the duality and the dual elements.	Remember	CO 2	AEEB03.04
20	Give the importance of tie-set matrix with electrical networks.	Understand	CO 2	AEEB03.04
21	If three equal value resistors with $R=3\text{ohm}$ are in star , determine their equivalent values in delta connection	Understand	CO 2	AEEB03.04

**PART - B (LONG ANSWER QUESTIONS)**

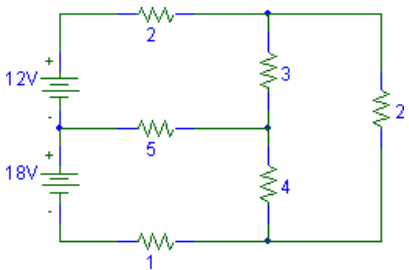
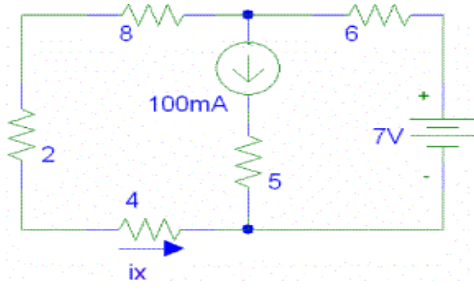
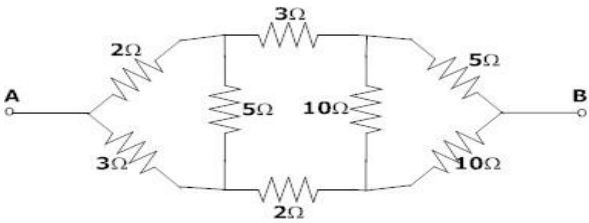
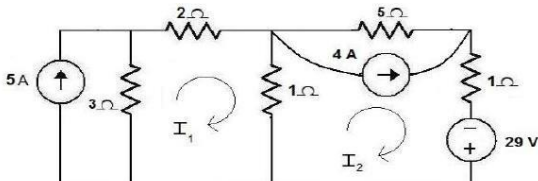
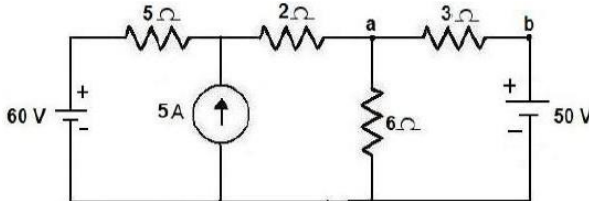
1	Discuss the method used to determine loop currents for multiple loop network with an neat example.	Understand	CO 2	AEEB03.04
2	Summarize the procedure to calculate node voltages of an electrical network using nodal analysis.	Understand	CO 2	AEEB03.04
3	Discuss the method used to determine loop currents for multiple loop network with ideal current source between any two meshes.	Understand	CO 2	AEEB03.04
4	Summarize the procedure to calculate node voltages of an electrical network with ideal voltage source between any two nodes.	Understand	CO 2	AEEB03.04
5	Explain the inspection method to write mesh equation for an network.	Understand	CO 2	AEEB03.04
6	Explain the inspection method to write nodal equation for an network.	Understand	CO 2	AEEB03.04
7	Derive the expressions of star-delta transformations to determine the equivalent resistance of complex network.	Understand	CO 2	AEEB03.04

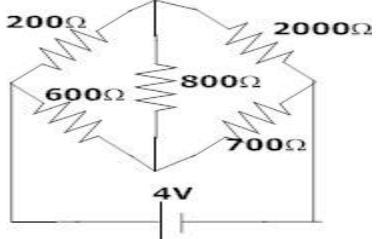
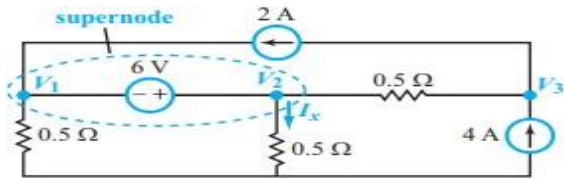
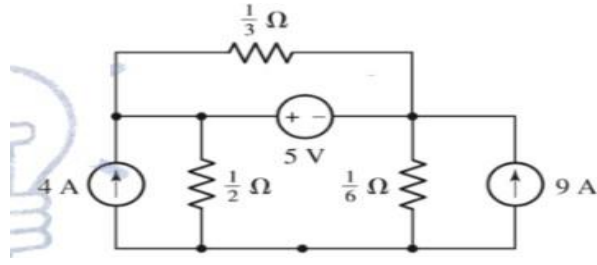
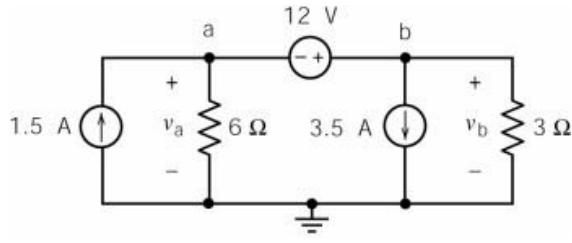
8	Define terms graph, oriented and non-oriented graph, planar and non-planar graph, tree and co-tree, branches and links, nodes and degree of the node.	Remember	CO 2	AEEB03.05
9	Explain the formation of incidence matrix with an example.	Understand	CO 2	AEEB03.06
10	Demonstrate the formation of matrix using tie-sets for the determination of relation between link currents and branch currents.	Understand	CO 2	AEEB03.06
11	Describe the method for the formation of matrix used to give relation between branch and twig voltages.	Understand	CO 2	AEEB03.06
12	Explain the dual elements and dual network with neat example.	Understand	CO 2	AEEB03.04
13	Determine the branch currents in terms of link currents using tie-set matrix with an example.	Understand	CO 2	AEEB03.06
14	Determine the branch voltages in terms of twig voltages using cut-set matrix with an example.	Understand	CO 2	AEEB03.06
15	Take any graph and draw all possible trees, basic tie-sets and basic cut-sets.	Understand	CO 2	AEEB03.06

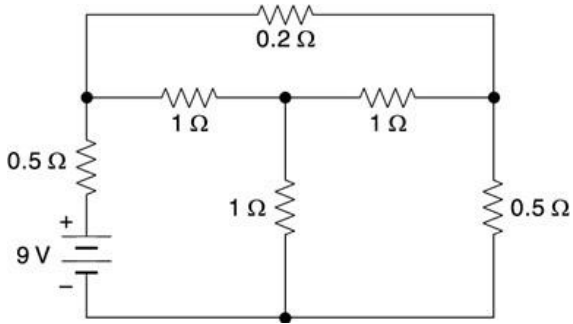
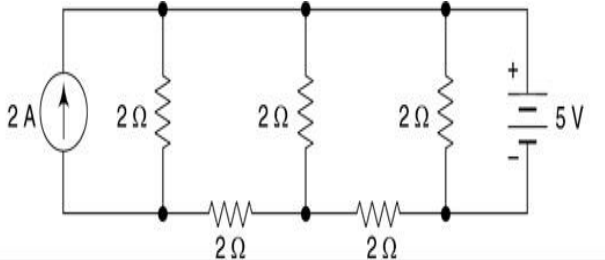
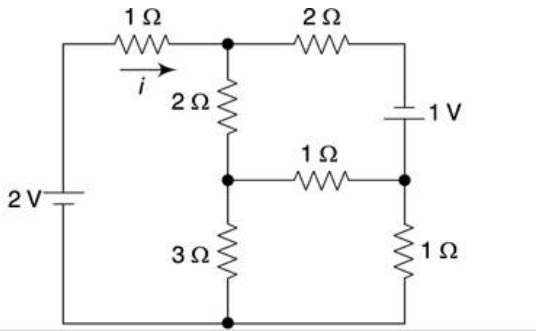
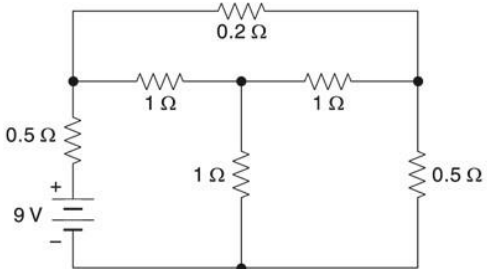
**Part - C (Analytical Questions)**

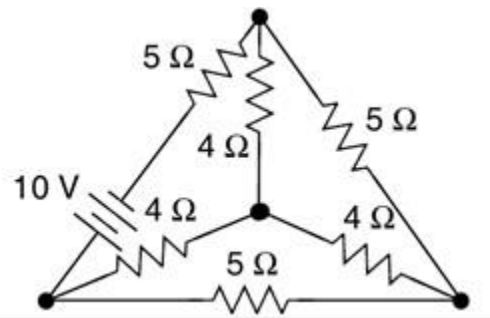
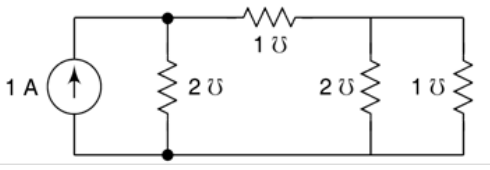
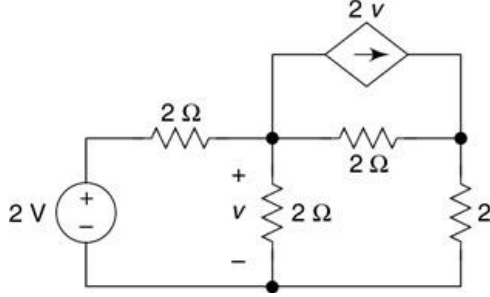
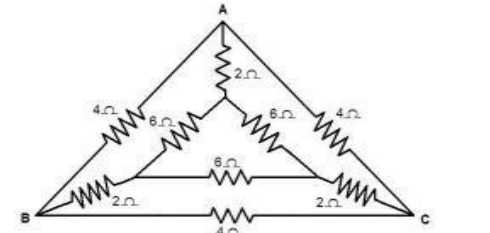
1	<p>Apply mesh analysis and calculate the current flowing through 3 Ohms element for the network shown in figure below?</p> 	Understand	CO 2	AEEB03.04
2	<p>Apply nodal analysis and determine the current flowing through each element for the network shown in figure below?</p> 	Understand	CO 2	AEEB03.04
3	<p>Determine the node voltages and power absorbed by 5 ohms resistor for the network shown in figure below?</p> 	Understand	CO 2	AEEB03.04



4	<p>Using inspection method, compute the current in each mesh and power loss in each element for the network shown in figure below?</p> 	Understand	CO 2	AEEB03.04
5	<p>Using inspection method, calculate the node voltages and power loss in each element for the network shown in figure below?</p> 	Understand	CO 2	AEEB03.04
6	<p>Calculate the voltage to be applied across AB in order to drive current of 5A in the circuit by using star-delta transformation for the network shown in figure below?</p> 	Understand	CO 2	AEEB03.04
7	<p>Determine the node voltages using nodal analysis for given circuit shown below?</p> 	Understand	CO 2	AEEB03.04
8	<p>Determine the current through branch a-b using mesh analysis shown in figure below?</p> 	Understand	CO 2	AEEB03.04

9	<p>Determine the current through 800 ohm resistor in the network shown in figure below?</p> 	Understand	CO 2	AEEB03.04
10	<p>Use the super node concept find the current <math>I_x</math> for the circuit shown in figure below?</p> 	Understand	CO 2	AEEB03.04
11	<p>Use super node analysis to find voltage across each current source i.e. <math>v_1</math> &amp; <math>v_2</math> in the figure below?</p> 	Understand	CO 2	AEEB03.04
12	<p>Determine the values of the node voltages, <math>v_a</math> and <math>v_b</math>, for this circuit shown in below?</p> 	Understand	CO 2	AEEB03.04

13	<p>For the network shown in figure below draw the graph and write tie- set schedule, obtain all branch currents from the loop equations?</p> 	Understand	CO 2	AEEB03.06
14	<p>Write the tie-set matrix for the following network shown in figure below?</p> 	Understand	CO 2	AEEB03.06
15	<p>Draw the oriented graph and obtain the tie-set matrix for the following network shown in figure?</p> 	Understand	CO 2	AEEB03.06
16	<p>Write the tie-set matrix for the network shown below?</p> 	Understand	CO 2	AEEB03.06

17	<p>Write the cut- set matrix for the network shown figure below?</p> 	Understand	CO 2	AEEB03.06
18	<p>Write the tie -set matrix for the network shown figure below?</p> 	Understand	CO 2	AEEB03.06
19	<p>Write the cut -set matrix for the network shown figure below?</p> 	Understand	CO 2	AEEB03.06
20	<p>Determine equivalent resistance between B and C shown in figure below?</p> 	Understand	CO 2	AEEB03.06
21	<p>Draw the graph from incident matrix and write tie-set matrix</p> <pre> 1 0 0 0 -1 -1 -1 -1 0 0 0 0 1 -1 0 0 1 0 1 1 </pre>	Understand	CO 2	AEEB03.06

22	<p>Draw the graph from incident matrix and write cut-set matrix</p> $\begin{matrix} 1 & 0 & 0 & 0 & -1 \\ -1 & -1 & -1 & 0 & 0 \\ 0 & 0 & 1 & -1 & 0 \\ 0 & 1 & 0 & 1 & 1 \end{matrix}$	Understand	CO 2	AEEB03.06
23	<p>Draw the following</p> <p>i) Graph</p> <p>ii) Tree</p> <p>iii) Dual network of figure shown below</p>	Understand	CO 2	AEEB03.06
24	<p>Explain the principal of duality and draw the dual network for the network shown below?</p>	Understand	CO 2	AEEB03.06
25	<p>Determine the branch voltages using cut-set matrix for the graph shown below?</p>	Understand	CO 2	AEEB03.04
26	<p>Develop the fundamental tie-set matrix for the circuit shown in below?</p>	Understand	CO 2	AEEB03.06

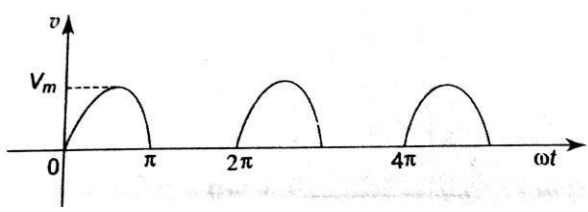
### UNIT - III

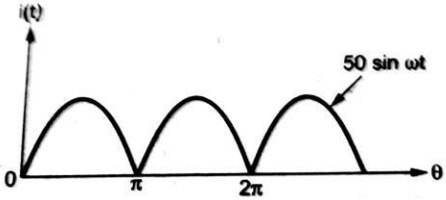
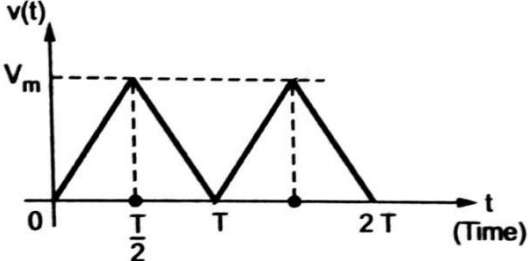
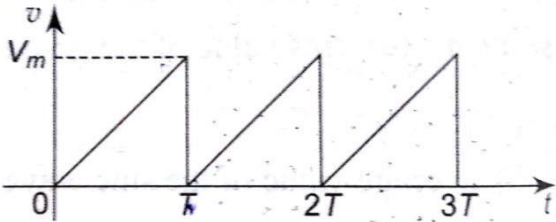
#### SINGLE PHASE AC CIRCUITS

##### Part - A (Short Answer Questions)

1	Define the alternating quantity.	Remember	CO 3	AEEB03.07
2	Give the difference between periodic and non-periodic wave form.	Understand	CO 3	AEEB03.07
3	Define the peak, peak to peak, average, RMS value also peak and form factor of sine function.	Remember	CO 3	AEEB03.07
4	Represent the alternating current and voltage in terms of sine function.	Remember	CO 3	AEEB03.07
5	Write the expression for reactance offered by inductor and capacitor.	Remember	CO 3	AEEB03.08
6	Give the net impedance offered by commercial inductor and capacitor.	Understand	CO 3	AEEB03.08
7	Define the term admittance of circuit.	Remember	CO 3	AEEB03.08

8	If two impedances of $(2 + 3j)$ ohms and $(4 + 5j)$ ohms are in series, calculate the total impedance, and source current	Understand	CO 3	AEEB03.08
9	Draw the impedance triangle and explain in detail.	Remember	CO 3	AEEB03.08
10	Draw the power triangle and explain in detail.	Remember	CO 3	AEEB03.08
11	An AC circuit consists of 20 ohms resistance and an inductor in series, determine the value of inductance if total impedance is $(20 + 25j)$ ohms.	Understand	CO 3	AEEB03.08
12	Write the expressions for voltage wave forms if wave form B lags wave form A by 30 degrees from reference axis.	Understand	CO 3	AEEB03.07
13	For the given alternating voltage, compute peak, peak to peak, average, RMS values. $V(t) = 25 \sin \omega t$ .	Understand	CO 3	AEEB03.07
14	Explain Why average value is defined for half cycle of sine wave.	Understand	CO 3	AEEB03.07
15	In an AC circuit source applied is $100 \sin 100t$ across series combination of 4 ohms and 13 F, calculate source current flowing through circuit.	Understand	CO 3	AEEB03.08
16	If the voltage applied is $(3 + 7j)V$ and current flowing through circuit is $(4 + 8j)A$ , calculate complex power and write individual units.	Understand	CO 3	AEEB03.08
17	If the voltage applied is 50V with 45 degrees and current flowing through circuit is 15A with 15 degrees, determine complex power.	Understand	CO 3	AEEB03.08
18	Define the power factor of the circuit and give its importance.	Remember	CO 3	AEEB03.08
19	Define electrical resonance.	Remember	CO 3	CEE003.10
20	Give the condition for circuit to be under resonance.	Understand	CO 3	AEEB03.10
21	Define series and parallel resonance.	Understand	CO 3	AEEB03.10
22	Give the importance cut-off frequency.	Understand	CO 3	AEEB03.10
23	Write the expression for bandwidth in terms of resonant frequency and quality factor.	Remember	CO 3	AEEB03.10
24	Define quality factor .Write Q-factor of inductor and capacitor.	Remember	CO 3	AEEB03.10
25	Write the expression for resonant frequency of series and parallel RLC circuit.	Remember	CO 3	AEEB03.10
26	In an series RLC circuit $R = 1K$ ohms, $L = 10mH$ and $C = 0.01 \mu F$ , Determine resonant frequency, bandwidth and quality factor.	Understand	CO 3	AEEB03.10
27	In an series RLC circuit, $R = 10$ ohms, $X_L = 25$ ohms, calculate the C value if circuit is under resonance at 40Hz and then determine impedance of the circuit at 50Hz.	Understand	CO 3	AEEB03.10
<b>PART - B (LONG ANSWER QUESTIONS)</b>				
1	Define the terms peak, peak to peak, average, RMS values, peak factor and form factor of sine wave.	Remember	CO 3	AEEB03.07
2	Derive the expression for average and RMS values of sine wave.	Understand	CO 3	AEEB03.07
3	Discuss the concept of reactance and impedance offered by R, L, C parameters.	Understand	CO 3	AEEB03.07
4	Explain the concept of susceptance and admittance offered by R, L, C parameters.	Understand	CO 3	AEEB03.08
5	Compute all types of relations between two wave forms and write the relevant expressions.	Understand	CO 3	AEEB03.08
6	Explain the concept of active, reactive, apparent power and draw power triangle.	Understand	CO 3	AEEB03.07

7	Co-relate the impedance triangle with power triangle and explain In detail.	Understand	CO 3	AEEB03.08
8	Explain the terms phase, phase difference and Phasor diagram with neat example.	Understand	CO 3	AEEB03.08
9	Summarize the features of electrical network with DC and AC excitation..	Remember	CO 3	AEEB03.08
10	Explain the nature of power factor in inductive and capacitive circuits.	Understand	CO 3	AEEB03.08
11	Derive the expression for true power in ac circuits.	Remember	CO 3	AEEB03.08
12	Derive the expressions for reactance and impedance of inductor and capacitor.	Understand	CO 3	AEEB03.08
13	Determine the voltage, current and power in series RL circuit using sinusoidal excitation.	Understand	CO 3	AEEB03.09
14	Predict the voltage, current and power in series RC circuit using sinusoidal excitation.	Remember	CO 3	AEEB03.09
15	Estimate the voltage, current and power in series RLC circuit using sinusoidal excitation.	Understand	CO 3	AEEB03.09
16	Determine the voltage, current and power in parallel RL circuit using sinusoidal excitation.	Understand	CO 3	AEEB03.09
17	Predict the voltage, current and power in parallel RC circuit using sinusoidal excitation.	Remember	CO 3	AEEB03.09
18	Estimate the voltage, current and power in parallel RLC circuit using sinusoidal excitation.	Understand	CO 3	AEEB03.09
19	Define series resonance. Explain the voltage plots in series RLC circuit with resonance phenomenon.	Understand	CO 3	AEEB03.10
20	Define cut-off frequency and bandwidth .Derive the expression for bandwidth of series RLC circuit.	Remember	CO 3	AEEB03.10
21	Give the importance of Q-factor. Derive the expressions for Q-factor of inductor and capacitor element in series RLC circuit.	Remember	CO 3	AEEB03.10
22	Estimate the expression for quality factor in parallel RLC circuits.	Remember	CO 3	AEEB03.10
23	Decide the range of frequencies using series RLC circuits within which desired signal can be transmitted.	Understand	CO 3	AEEB03.10
24	Estimate the range of frequencies using parallel RLC circuits within which desired signal can be transmitted.	Understand	CO 3	AEEB03.10
25	Explain the impedance and admittance curves in series and parallel RLC circuits respectively.	Remember	CO 3	AEEB03.10
<b>PART - C (ANALYTICAL QUESTIONS)</b>				
1	Obtain average value of sinusoidal waveform shown in figure?  	Understand	CO 3	AEEB03.07

2	Find R.M.S value of waveform shown in figure below? 	Understand	CO 3	AEEB03.07
3	Find the Form factor for the figure shown below? 	Understand	CO 3	AEEB03.07
4	Find the R.M.S value of the waveform shown in figure below? 	Understand	CO 3	AEEB03.07
5	In an AC circuit source applied is $500\sin 100t$ across series combination of 8 ohms and 15H, determine total impedance, phase angle between voltage and current in circuit and power factor of the circuit.	Understand	CO 3	AEEB03.09
6	In an AC circuit source applied is $500\sin 100t$ across series combination of 7 ohms and 8F, calculate source current flowing through circuit, total impedance and draw the power triangle.	Understand	CO 3	AEEB03.09
7	In an ac circuit two parallel impedances are connected in series with $Z_1$ across AB terminals, where AB terminals are fed by 150V 0 degrees. Compute total impedance, power factor, source current and voltage drop across $Z_2$ $Z_1 = (2 + j)$ ohms $Z_2 = (4 + 5j)$ ohms $Z_3 = (1 + 5j)$ ohms	Understand	CO 3	AEEB03.09
8	In an AC circuit source applied is $200\sin 60t$ across series combination of 12 ohms and 25H, determine total impedance, phase angle between voltage and current in circuit and power factor of the circuit.	Understand	CO 3	AEEB03.09
9	In an AC circuit source applied is $10\sin 50t$ across series combination of 16 ohms and $50\mu\text{F}$ , determine total impedance, phase angle between voltage and current in circuit and power factor of the circuit.	Understand	CO 3	AEEB03.09
10	In an AC circuit source applied is $100\sin 50t$ across series combination of 16 ohms and 30H, determine total impedance, phase angle between voltage and current in circuit and power factor of the circuit.	Understand	CO 3	AEEB03.09
11	If the voltage applied is $(10 + 8j)\text{V}$ and current flowing through circuit is $(3 + 5)\text{A}$ , calculate complex power and circuit constants.	Understand	CO 3	AEEB03.09



12	In an ac circuit two parallel impedances are in connected across AB terminals, where AB terminals are fed by 150V , 0 degrees with series impedance of Z3.. Compute total impedance, power factor, source current and voltage drop across Z2 Z1= (1 + j)ohms Z2= (3 + 5j)ohms Z3= (2 + 5j)ohms	Understand	CO 3	AEEB03.09
13	In an ac circuit two parallel impedances are connected across AB terminals , where AB terminals are fed by 200V 50 degrees with series impedance of Z3 . Calculate total impedance, admittance ,power factor, power factor of each branch and current flowing through each element Z1= (2 + j)ohms Z2= (3 + 5j)ohms Z3= (3 + 5j)ohms.	Understand	CO 3	AEEB03.09
14	In an ac circuit two parallel impedances are connected in series with Z1 across AB terminals, where AB terminals are fed by 200V 0degrees. Determine total impedance, power factor, source current, power factor of each branch and voltage drop across Z3 Z1= (8 + j)ohms Z2= (1 + 6j)ohms Z3= (3 + 5j) ohms.	Understand	CO 3	AEEB03.09
15	If the voltage applied is (10- 8j) V and current flowing through circuit is (3 – 5j) A, Determine complex power and circuit constants.	Understand	CO 3	AEEB03.09
16	The voltage of a circuit is $v = 200 \sin (wt + 30^\circ)$ and the current is $i = 50 \sin(wt + 60^\circ)$ . Determine i) The average power, reactive power and apparent power. ii) The circuit elements if $w = 100\pi$ rad /sec.	Understand	CO 3	AEEB03.09
17	A series RC circuit with $R=2k\Omega$ and $C=0.1\mu F$ . Determine total impedance Z, current I, phase angle.	Remember	CO 3	AEEB03.09
18	A series circuit consisting of a $10\Omega$ resistor, a $100\mu F$ capacitor and a 10 mH inductor is driven by a 50 Hz a.c. voltage source of maximum value 100 volts. Calculate the equivalent Impedance, current through circuit, power factor and power dissipated.	Understand	CO 3	AEEB03.09
19	A series RC circuit with $R=5k\Omega$ and $C=0.2\mu F$ . Determine total impedance Z, current I, phase angle, voltage across the resistance $V_R$ and voltage across the capacitance $V_C$ .	Understand	CO 3	AEEB03.09
20	Determine impedance and phase angle of series RLC circuit with $R=10\Omega$ , $L=0.2mH$ and $C=0.5\mu F$ .	Understand	CO 3	AEEB03.09
21	In an ac circuit two parallel impedances are connected in series with Z1 across AB terminals, where AB terminals are fed by 200V 0degrees. Determine total impedance, power factor, source current, power factor of each branch and voltage drop across Z3. Z1= (8 + 2j)ohms Z2= (2 + 6j)ohms Z3= (6 + 10j)ohms.	Remember	CO 3	AEEB03.09
22	A series RLC circuit with 8 ohms resistance should be designed to have a band width of 50Hz , Determine value of L and so that the circuit resonates at 250Hz	Understand	CO 3	AEEB03.10
23	A series RLC circuit is connected across a variable frequency supply and has $R = 12$ ohms, $L = 1mH$ and $C = 1000PF$ . Compute resonant frequency, Q factor and cut of frequencies.	Understand	CO 3	AEEB03.10

24	A voltage $V = 10 \sin \omega t$ is applied to series RLC circuit. Under resonance condition the maximum voltage across capacitor is found to be 500V, bandwidth is 400 rad/sec and the impedance at resonance is 100 ohms. Calculate the resonant frequency and circuit constants.	Understand	CO 3	AEEB03.10
25	An iron ring 10cm diameter and 15cm <sup>2</sup> in cross section is wound with 250 turns of wire for a flux density of 1.5 wb/cm <sup>2</sup> and permeability 500. Estimate the exciting current to the inductance and field intensity.	Understand	CO 3	AEEB03.10
25	A series RLC circuit is connected across a variable frequency supply and has $R = 1000$ ohms, $L = 1$ mH and $C = 0.01 \mu\text{F}$ . Determine resonant frequency, Q factor, bandwidth and cut of frequencies.	Remember	CO 3	AEEB03.10
26	A series RLC circuit is connected across a supply of $50 \sin 100t$ has $R = 2$ ohms, $L = 1$ mH and $C = 0.4$ . Calculate resonant frequency, Q factor, bandwidth and cut of frequencies and current at resonant frequency.	Understand	CO 3	AEEB03.10
27	Series RLC circuit has $L = 50 \mu\text{H}$ , $C = 2000$ pF and $R = 50 \Omega$ . Determine Q factor of the circuit a. The new value of C required for resonance at the same frequency if the inductance is doubled. b. the new value of Q factor	Understand	CO 3	AEEB03.10
28	Given series RLC Circuit $R=10$ ohms $L=1$ mH $c=1$ $\mu$ F is connected across sinusoidal source of 20V with variable frequency . Determine resonant frequency, Q factor under resonance and half power frequencies	Remember	CO 3	AEEB03.10
29	Series resonance network consisting of a resistor of $30 \Omega$ , a capacitor of $2 \mu\text{F}$ and an inductor of $20$ mH is connected across a sinusoidal supply voltage $100 \sin 50t$ compute : a. The resonant frequency, b. The current at resonance, c. The voltage across the inductor and capacitor at resonance d. The quality factor e. The bandwidth of the circuit.	Understand	CO 3	AEEB03.10
30	A series circuit consists of a resistance of $4 \Omega$ , an inductance of $500$ mH and a variable capacitance connected across a $100$ V, $50$ Hz supply. Calculate : a. The capacitance require to give series resonance b. The voltages generated across both the inductor and the capacitor under resonance.	Remember	CO 3	AEEB03.10

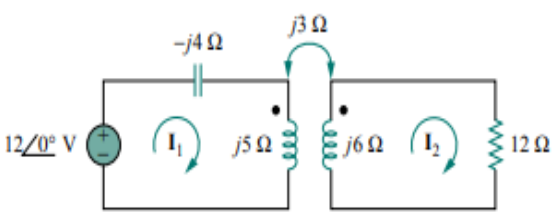
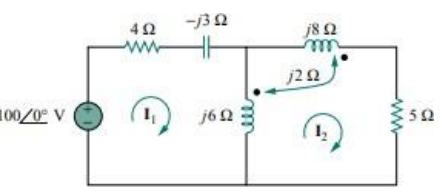
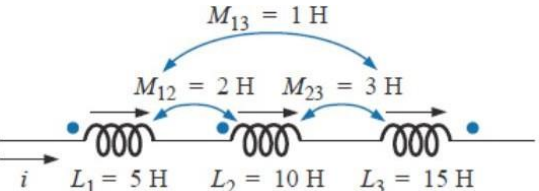
#### UNIT – IV

#### MAGNETIC CIRCUITS

#### PART – A (SHORT ANSWER QUESTIONS)

1	Define term magnetic flux and write its units?	Understand	CO 4	AEEB03.12
2	Define terms self inductance, mutual inductance?	Understand	CO 4	AEEB03.12
3	Write expression for equivalent inductance when two coils are coupled in series aiding connection?	Remember	CO 4	AEEB03.12
4	Write expression for equivalent inductance when two coils are coupled in parallel aiding connection?	Remember	CO 4	AEEB03.12
5	Define reluctance.	Understand	CO 4	AEEB03.12
6	State faraday's law of electro-magnetic induction.	Remember	CO 4	AEEB03.11
7	Write the expression for co-efficient of coupling and Define perfect coupling.	Remember	CO 4	AEEB03.12
8	Define reluctance and write the expression their suggest Core to be chosen for magnetic circuit.	Remember	CO 4	AEEB03.12
9	Write the condition from dot convention to form voltage equation.	Understand	CO 4	AEEB03.12

10	Two coils of are connected in series , when they are aiding with each other total inductance is 25H and when they are opposing each other is 15H, Determine the mutual inductance.	Understand	CO 4	AEEB03.12
11	Two coils of are connected in parallel , when they are aiding with each other if self inductance of each coil is 10H and mutual inductance is 1H, compute equivalent inductance.	Understand	CO 4	AEEB03.12
12	Write flux density in terms of field intensity.	Remember	CO 4	AEEB03.12
<b>PART – B (LONG ANSWER QUESTIONS)</b>				
1	Explain the concept of DOT convention and state right hand thumb rule for coupled coils.	Understand	CO 4	AEEB03.11
2	Derive the expression for co-efficient of coupling helps in identifying how strongly two coils are coupled.	Remember	CO 4	AEEB03.12
3	Predict the amount of magnetic flux developed in the composite magnetic circuit.	Understand	CO 4	AEEB03.12
4	Explain the concept of more than two coils coupled in series and derive the expressions for voltage induced, equivalent inductance.	Understand	CO 4	AEEB03.12
5	What is the differences between dynamically induced e.m.f and statically induced e.m.f?	Remember	CO 4	AEEB03.12
6	Explain the clear difference between self inductance and mutual inductance and write various expressions for self and mutual inductance?	Remember	CO 4	AEEB03.12
7	Explain the the procedure to analyze the series magnetic circuit with suitable example?	Remember	CO 4	AEEB03.13
8	Explain the the procedure to analyze the series magnetic circuit with airgap with suitable example?	Remember	CO 4	AEEB03.13
9	Explain the the procedure to analyze the parallel magnetic circuit with suitable example?	Remember	CO 4	AEEB03.13
<b>PART - C (ANALYTICAL QUESTIONS)</b>				
1	Two coils with a coefficient of coupling of 0.5 between them are in series so as to magnetize the a)in the same direction(series aiding) b)in the opposite direction(series opposition).the corresponding values of equivalent inductance for a)1.9H b)0.7H.find the self inductance of each coil, mutual inductance of each coil, mutual inductance between the coil	Understand	CO 4	AEEB03.12
2	An iron ring of mean length 100cm and cross sectional area of 10cm <sup>2</sup> has an air gap of 1mm cut in it. it is wound with a coli of 100 turns. Assume relative permeability of iron is 500.calculate inductance of coil.	Understand	CO 4	AEEB03.12
3	An ring shaped electromagnet has an air gap of 6mm and of cross sectional area 12 cm <sup>2</sup> .the mean length of the core being 60cm and cross sectional area area 12 cm <sup>2</sup> .calculate the mmf required to produce a flux density of 0.4 wb/m <sup>2</sup> in the gap. Assume the relative permeability of material as 600.	Understand	CO 4	AEEB03.12
4	Two coupled coils with L1 =0.02H,L2=0.01H,k=0.5 are connected in four different ways: series aiding, series opposing and parallel with both arrangements of the winding sense. what area the four equivalent inductances?	Understand	CO 4	AEEB03.12
5	An iron ring of mean length 200cm and cross sectional area of 20cm <sup>2</sup> has an air gap of 1mm cut in it. it is wound with a coli of 100 turns. Assume relative permeability of iron is 500.calculate inductance of coil.	Understand	CO 4	AEEB03.12

6	<p>Calculate the phasor currents <math>I_1</math> and <math>I_2</math> in the circuit of figure below?</p> 	Remember	CO 4	AEEB03.12
7	<p>Calculate the mesh currents in the circuit of Figure below?</p> 	Understand	CO 4	AEEB03.12
8	<p>Find the total inductance of series coil shown in figure below?</p> 	Understand	CO 4	AEEB03.12

**UNIT – V**

**NETWORK THEOREMS (DC AND AC)**

**Part - A (Short Answer Questions)**

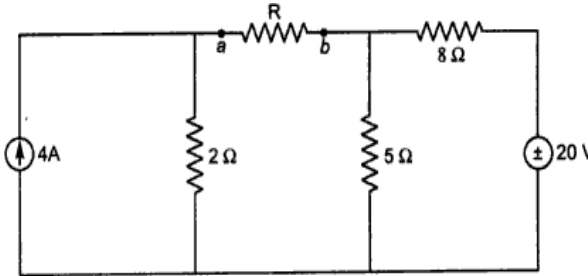
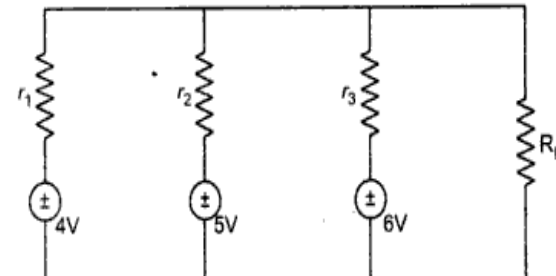
1	State Tellegen's theorem.	Remember	CO 5	AEEB03.14
2	State Thevenin's theorem.	Remember	CO 5	AEEB03.15
3	State Norton's theorem.	Remember	CO 5	AEEB03.14
4	State super-position theorem.	Remember	CO 5	AEEB03.14
5	State reciprocity theorem.	Remember	CO 5	AEEB03.14
6	State compensation theorem.	Remember	CO 5	AEEB03.15
7	State Milliman's theorem.	Remember	CO 5	AEEB03.15
8	State maximum power transfer theorem	Remember	CO 5	AEEB03.15
9	Give the application of maximum power transfer theorem	Remember	CO 5	AEEB03.15
10	If the Thevenin's equivalent consists of 25v with 10 ohms draw the Norton's equivalent.	Understand	CO 5	AEEB03.14
11	If 25v, 15v and 10v are connected across AB terminals, Determine voltage measured across AB terminals.	Understand	CO 5	AEEB03.14

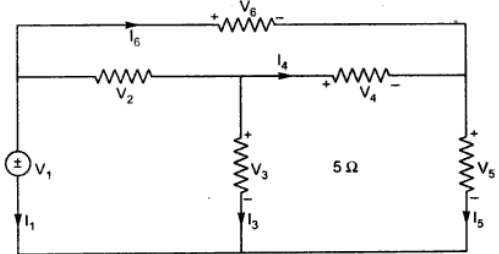
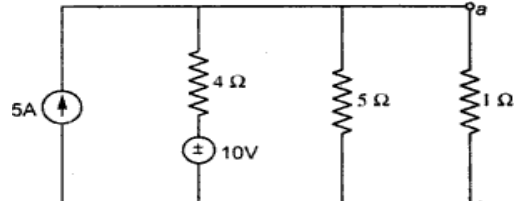
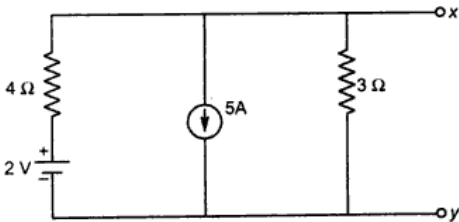
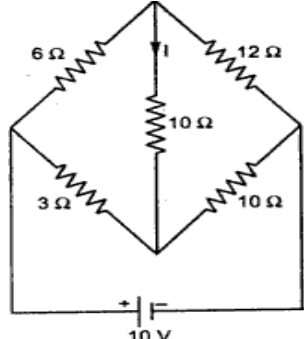
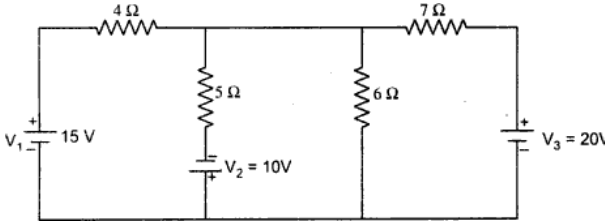
12	List the limitations of super-position theorem.	Understand	CO 5	AEEB03.15
13	The Norton's equivalent circuit consists of 10A in parallel with 8 ohms, determine the load resistance for which maximum power transfer takes place.	Understand	CO 5	AEEB03.14
14	If two branches are in parallel with 15V in series with 5 ohms and 5V in series with 1 ohm across AB terminals , calculate the current and power absorbed by 5 ohms resistor if it is connected across AB terminals.	Understand	CO 5	AEEB03.15

**PART – B (LONG ANSWER QUESTIONS)**

1	State and prove Tellegen's theorem with an example for DC excitation.	Understand	CO 5	AEEB03.14
2	State and verify Thevenin's theorem with an example for DC excitation.	Understand	CO 5	AEEB03.15
3	State and verify Norton's theorem with an example for DC excitation.	Understand	CO 5	AEEB03.15
4	State and prove super-position theorem with an example for DC excitation.	Understand	CO 5	AEEB03.14
5	State and prove reciprocity theorem with an example for DC excitation.	Understand	CO 5	AEEB03.14
6	State and explain compensation theorem with an example for DC excitation.	Understand	CO 5	AEEB03.14
7	State and prove Milliman's theorem theorem with an example for DC excitation.	Understand	CO 5	AEEB03.15
8	Derive the condition for maximum power transfer with DC excitation and verify with an example.	Understand	CO 5	AEEB03.14
9	Explain the Thevenin's equivalent and norton's equivalent circuit with their importance.	Understand	CO 5	AEEB03.15

**PART - C (ANALYTICAL QUESTIONS)**

1	Determine the value of resistance R so the maximum power transfer takes place from the rest of the network to R in fig. 	Understand	CO 5	AEEB03.14
2	Using Milliman's theorem Determine the current through $R_L$ in the circuit and the voltage drop. ( $r_1 = r_2 = r_3 = 2\Omega$ , $R_L = 5\Omega$ ) 	Understand	CO 5	AEEB03.15

3	<p>Verify Tellegen's theorem provide <math>V_1=8V</math>, <math>V_2=4V</math>, <math>V_4=2V</math>, <math>I_1=4A</math>, <math>I_2=2A</math> and <math>I_3=1A</math>.</p> 	Understand	CO 5	AEEB03.14
4	<p>Determine power loss in <math>1\Omega</math> resistor by Thevenin's theorem.</p> 	Understand	CO 5	AEEB03.15
5	<p>Draw the Norton's equivalent circuit across x-y for the network shown in below.</p> 	Understand	CO 5	AEEB03.15
6	<p>Using Thevenin's theorem determine the current <math>I</math> in the network.</p> 	Understand	CO 5	AEEB03.14
7	<p>Determine the current through the <math>6\Omega</math> resistor using Thevenin's theorem.</p> 	Understand	CO 5	AEEB03.15

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