# INSTITUTEOFAERONAUTICALENGINEERING

**(Autonomous)**
Dundigal, Hyderabad-500043

## COMPUTER SCIENCE AND ENGINEERING

## TUTORIAL QUESTION BANK

| | | | | | |
|---|---|---|---|---|---|
| **Course Title** | **FUNDAMENTALS OF ELECTRICAL ENGINEERING** | | | | |
| **Course Code** | **AEEB01** | | | | |
| **Programme** | **B.Tech** | | | | |
| **Semester** | **I** | **CSE** | | | |
| **Course Type** | **Foundation** | | | | |
| **Regulation** | **IARE - R18** | | | | |
| **Course Structure** | **Theory** | | | **Practical** | |
| | **Lectures** | **Tutorials** | **Credits** | **Laboratory** | **Credits** |
| | **3** | **1** | **4** | **-** | **-** |
| **Chief Coordinator** | **Mr. A Naresh Kumar, Assistant Professor** | | | | |
| **Course Faculty** | **Dr. M Laxmidevi Ramanaiah, Associate Professor**<br>**Mr. A Nareshkumar, Assistant Professor**<br>**Mr. K Lingaswamy, Assistant Professor**<br>**Mr. A Srikanth, Assistant Professor**<br>**Mr. T Mahesh, Assistant Professor**<br>**Mr. N Shivaprasad, Assistant Professor** | | | | |

## COURSE OBJECTIVES:

| **The course should enable the students to:** | |
|---|---|
| I | Understand the basic electrical circuits and circuit laws to study behavior of electrical networks. |
| II | Use different network reduction techniques to study characteristics of electrical networks. |
| III | Analyze series and parallel AC circuits using complex notation. |
| IV | State and use DC circuit theorems to determine unknown currents and voltages. |

## COURSE OUTCOMES (COs):

| | |
|---|---|
| CO 1 | Understand the basic concepts of electricity, electrical circuits elements, application's of Kirchhoff laws to complex circuits. |
| CO 2 | Explore to the working of mesh analysis and nodal analysis, inspection method, super mesh, super node analysis. |
| CO 3 | Summarize various alternating quantities such as instantaneous, peak, RMS, average, form factor and peak factor for different periodic wave forms. |

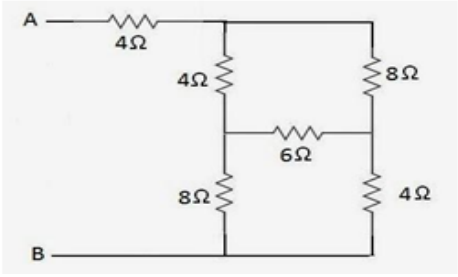
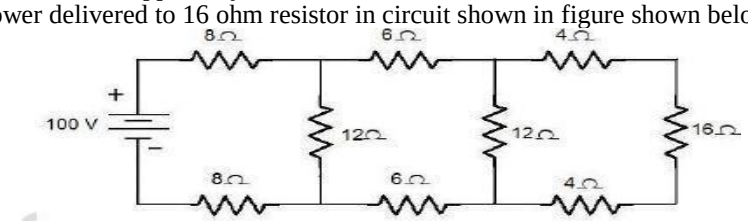
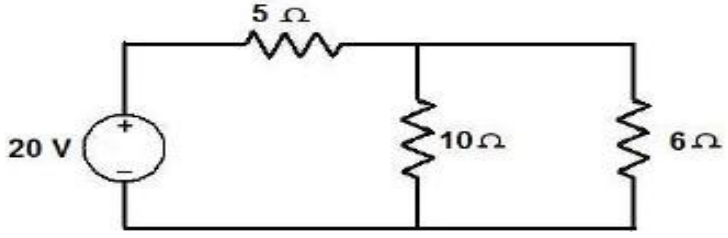
| | |
|---|---|
| CO 4 | Discuss the basic theory of real, reactive, apparent power and complex power, power factor. |
| CO 5 | Explain the concepts of graph, tree, incidence matrix, basic cut set and basic tie set matrices for planar networks, duality and dual networks. |

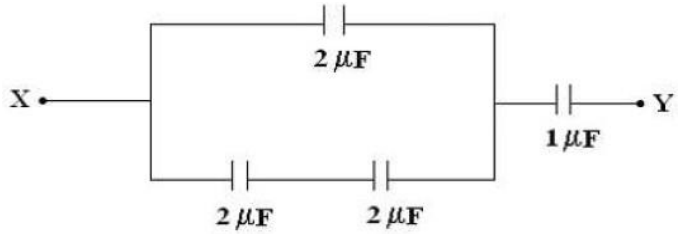
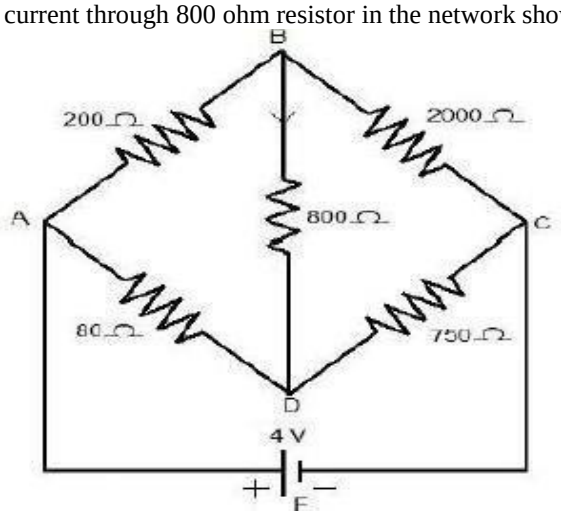
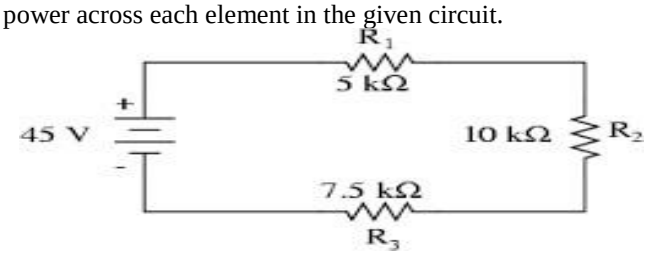
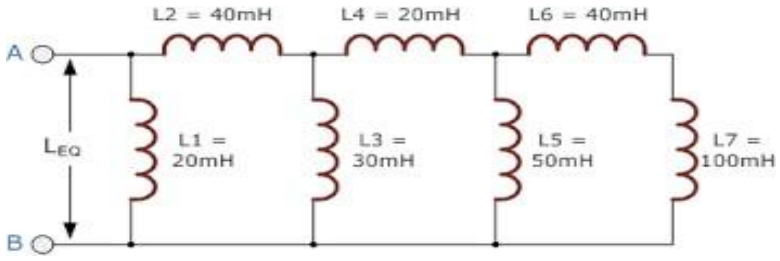
## COURSE LEARNING OUTCOMES (CLOs):

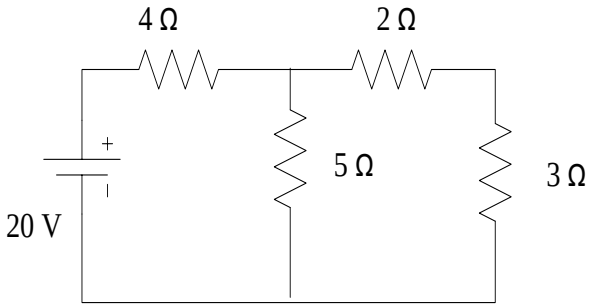
| | |
|---|---|
| AEEB01.01 | Define the various nomenclature used to study the DC electrical circuits. |
| AEEB01.02 | Understand the concept of electrical circuit and classify electrical circuits elements. |
| AEEB01.03 | Analyze the circuits using Kirchhoff's current and Kirchhoff's voltage law. |
| AEEB01.04 | Use of series-parallel concepts for simplifying circuits. |
| AEEB01.05 | Describe source transformation technique to determine equivalent resistance and source current. |
| AEEB01.06 | Apply network reduction techniques to calculate unknown quantities associated with electrical circuits. |
| AEEB01.07 | Summarize the procedure of mesh analysis and nodal analysis, inspection method, super mesh, super node analysis. |
| AEEB01.08 | Apply the concept of network theorems. |
| AEEB01.09 | Summarize the procedure of thevenin's and norton's theorems to reduce complex network into simple equivalent network. |
| AEEB01.10 | List out various alternating quantities such as Sinusoidal AC voltage, average and RMS values, form and peak factor, and understand concept of three phase alternating quantity. |
| AEEB01.11 | Interpret the alternating quantities with its instantaneous, average and root mean square values. |
| AEEB01.12 | Illustrate the concept of impedance, reactance, admittance, susceptance and conductance. |
| AEEB01.13 | Understand the phase and phase difference and j notation. |
| AEEB01.14 | Discuss representation of rectangular and polar forms. |
| AEEB01.15 | Analyze the steady state behavior of R, L and C elements with sinusoidal excitation. |
| AEEB01.16 | Analyze the steady state behavior of series and parallel RL and RC circuits with sinusoidal excitation. |
| AEEB01.17 | Analyze the steady state behavior of series and parallel RLC circuits with sinusoidal excitation. |
| AEEB01.18 | Illustrate the concept of real, reactive, apparent power and complex power. |
| AEEB01.19 | Interpret the power factor in single phase AC circuits. |
| AEEB01.20 | Discuss the various nomenclatures related with network topology. |
| AEEB01.21 | Formulate incidence, tie-set and cut-set matrix which are used to solve the behavior of complex electrical circuits. |
| AEEB01.22 | Understand the concepts of duality and importance of dual networks. |

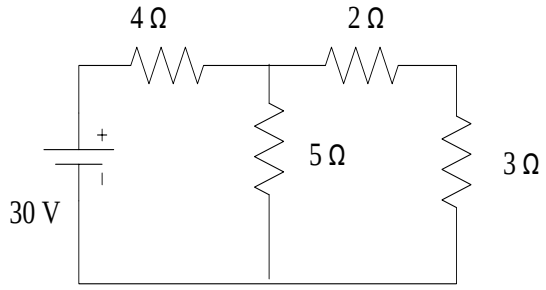
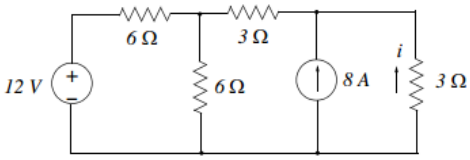
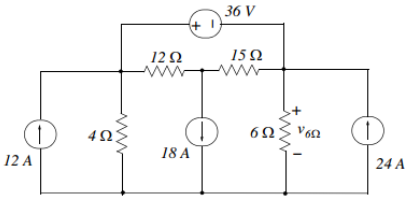
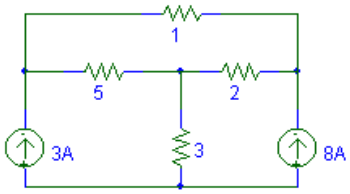
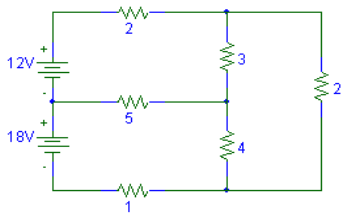
**TUTORIAL QUESTION BANK**

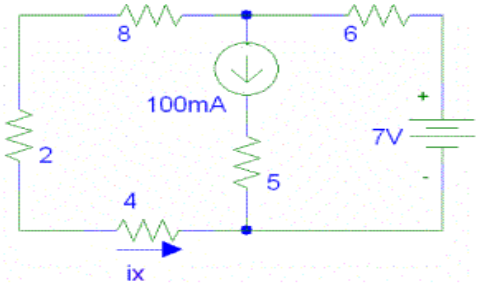
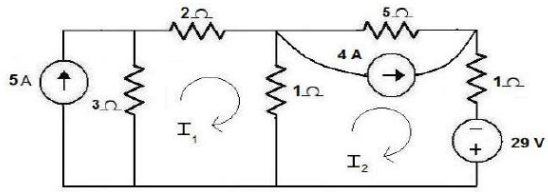
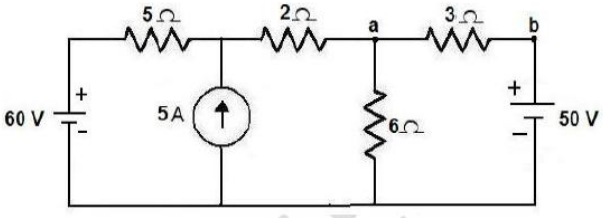
<table>
<tr><th colspan="5">MODULE- I</th></tr>
<tr><th colspan="5">INTRODUCTION TO ELECTRICAL CIRCUITS</th></tr>
<tr><th colspan="5">Part - A (Short Answer Questions)</th></tr>
<tr><th>S. No</th><th>QUESTIONS</th><th>Blooms Taxonomy Level</th><th>Course Outcomes</th><th>Course Learning Outcomes (CLOs)</th></tr>
<tr><td>1</td><td>Define the inductance.</td><td>Remember</td><td>CO 1</td><td>AEEB01.01</td></tr>
<tr><td>2</td><td>Define the capacitance.</td><td>Remember</td><td>CO 1</td><td>AEEB01.01</td></tr>
<tr><td>3</td><td>Draw the symbols of different controlled sources.</td><td>Remember</td><td>CO 1</td><td>AEEB01.01</td></tr>
<tr><td>4</td><td>State and explain the potential difference.</td><td>Remember</td><td>CO 1</td><td>AEEB01.01</td></tr>
<tr><td>5</td><td>Define current.</td><td>Remember</td><td>CO 1</td><td>AEEB01.01</td></tr>
<tr><td>6</td><td>Define resistance.</td><td>Remember</td><td>CO 1</td><td>AEEB01.01</td></tr>
<tr><td>7</td><td>Give the expression for voltage in terms of W and Q.</td><td>Understand</td><td>CO 1</td><td>AEEB01.01</td></tr>
<tr><td>8</td><td>Give the charge of an electron.</td><td>Understand</td><td>CO 1</td><td>AEEB01.01</td></tr>
<tr><td>9</td><td>State OHM’s law.</td><td>Remember</td><td>CO 1</td><td>AEEB01.01</td></tr>
<tr><td>10</td><td>State Kirchhoff’s current and Kirchhoff’s voltage laws.</td><td>Remember</td><td>CO 1</td><td>AEEB01.01</td></tr>
<tr><td>11</td><td>Define the power and energy.</td><td>Remember</td><td>CO 1</td><td>AEEB01.01</td></tr>
<tr><td>12</td><td>Describe the active elements.</td><td>Remember</td><td>CO 1</td><td>AEEB01.01</td></tr>
<tr><td>13</td><td>Describe passive elements.</td><td>Remember</td><td>CO 1</td><td>AEEB01.01</td></tr>
<tr><td>14</td><td>Calculate the equivalent resistance of the circuit if applied voltage is 23V and current flowing through circuit is 4A, receiving a power of 92W.</td><td>Understand</td><td>CO 1</td><td>AEEB01.02</td></tr>
<tr><td>15</td><td>If the charge developed between two plates is 2C and capacitance is 4.5 F, calculate the voltage across the plates.</td><td>Understand</td><td>CO 1</td><td>AEEB01.02</td></tr>
<tr><th colspan="5">Part - B (Long Answer Questions)</th></tr>
<tr><td>1</td><td>Write short notes on voltage-current relations in RLC parameters.</td><td>Remember</td><td>CO 1</td><td>AEEB01.01</td></tr>
<tr><td>2</td><td>Explain the Kirchhoff’s laws with example and neat diagrams.</td><td>Understand</td><td>CO 1</td><td>AEEB01.01</td></tr>
<tr><td>3</td><td>Classify types of elements and explain in detail.</td><td>Understand</td><td>CO 1</td><td>AEEB01.01</td></tr>
<tr><td>4</td><td>Distinguish between ideal and practical energy sources.</td><td>Understand</td><td>CO 1</td><td>AEEB01.01</td></tr>
<tr><td>5</td><td>State Ohm’s law and give its applicability to electrical network.</td><td>Remember</td><td>CO 1</td><td>AEEB01.01</td></tr>
<tr><td>6</td><td>Explain convention current direction and voltage across an element.</td><td>Understand</td><td>CO 1</td><td>AEEB01.01</td></tr>
<tr><td>7</td><td>Write the conventions to study any electrical circuit.</td><td>Remember</td><td>CO 1</td><td>AEEB01.01</td></tr>
<tr><td>8</td><td>Define the terms voltage, current, power, energy, node and degree of the node.</td><td>Remember</td><td>CO 1</td><td>AEEB01.01</td></tr>
<tr><td>9</td><td>State current division rule and explain with neat example.</td><td>Remember</td><td>CO 1</td><td>AEEB01.01</td></tr>
<tr><td>10</td><td>State voltage rule and explain with neat example.</td><td>Remember</td><td>CO 1</td><td>AEEB01.01</td></tr>
<tr><td>11</td><td>Derive the V-I relationship, power and energy stored in inductor.</td><td>Understand</td><td>CO 1</td><td>AEEB01.01</td></tr>
<tr><td>12</td><td>Derive the V-I relationship, power and energy stored in capacitor.</td><td>Understand</td><td>CO 1</td><td>AEEB01.01</td></tr>
<tr><td>13</td><td>Derive the equivalent resistance equations when they are connected in series and parallel.</td><td>Understand</td><td>CO 1</td><td>AEEB01.02</td></tr>
<tr><td>14</td><td>Derive the equivalent inductance equations when they are connected in series and parallel.</td><td>Understand</td><td>CO 1</td><td>AEEB01.02</td></tr>
<tr><td>15</td><td>Derive the equivalent capacitance equations when they are connected in series and parallel.</td><td>Understand</td><td>CO 1</td><td>AEEB01.03</td></tr>
<tr><th colspan="5">Part - C (Problem Solving and Critical Thinking Questions)</th></tr>
<tr><td>1</td><td>Calculate the equivalent resistance and source current for the given data.<br><table><tr><td>Element</td><td>From node</td><td>To node</td></tr><tr><td>30 V source</td><td>a</td><td>0</td></tr><tr><td>4 ohms</td><td>a</td><td>b</td></tr><tr><td>5 ohms</td><td>b</td><td>0</td></tr><tr><td>2 ohms</td><td>b</td><td>c</td></tr><tr><td>3 ohms</td><td>c</td><td>0</td></tr><tr><td>5 ohms</td><td>c</td><td>d</td></tr><tr><td>6 ohms</td><td>d</td><td>0</td></tr></table></td><td>Understand</td><td>CO 1</td><td>AEEB01.01</td></tr>
<tr><td>2</td><td>In a network consisting of AB terminals, firstly a branch across AB is defined as 20V in series with 5 ohm, second branch 7 ohm and third branch 10V in series with 4 ohm. Calculate voltage drop across 7 ohm resistor.</td><td>Understand</td><td>CO 1</td><td>AEEB01.01</td></tr>
</table>

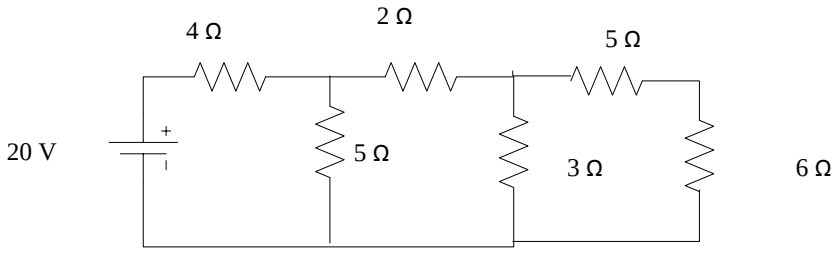
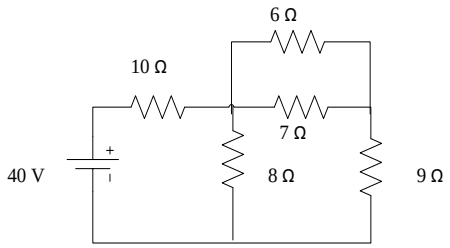
<table>
<tr><td>3</td><td>Use network reduction technique and calculate current response in each element.<br><br><table><tr><td>Element</td><td>From node</td><td>To node</td></tr><tr><td>25 V source</td><td>a</td><td>0</td></tr><tr><td>6 ohms</td><td>a</td><td>b</td></tr><tr><td>8 ohms</td><td>b</td><td>0</td></tr><tr><td>2 ohms</td><td>b</td><td>c</td></tr><tr><td>3 ohms</td><td>b</td><td>c</td></tr><tr><td>5 ohms</td><td>c</td><td>0</td></tr></table></td><td>Understand</td><td>CO 1</td><td>AEEB01.01</td></tr>
<tr><td>4</td><td>In a circuit branch AB = 10 ohm, BC = 20 ohm , CD = 15 ohm ,BD = 8 ohm and DA = 5 ohm and an source of 100V in series with 5ohm connected across A and C. Calculate equivalent resistance, source current and voltage drop across DA.</td><td>Understand</td><td>CO 1</td><td>AEEB01.01</td></tr>
<tr><td>5</td><td>In an circuit branch AB = 1 ohm , BC = 2 ohm , CD = 1 ohm ,BD = 8 ohm and DA = 5 ohm and an source of 100V in series with 5 ohm connected across Aand C. Calculate equivalent resistance, source current and voltage drop across DA.</td><td>Understand</td><td>CO 1</td><td>AEEB01.01</td></tr>
<tr><td>6</td><td>Consider an coil allowing an current of $i(t) = 4t^2$ , calculate voltage induced, power absorbed and energy stored by inductor, if its inductance is 5H.</td><td>Understand</td><td>CO 1</td><td>AEEB01.01</td></tr>
<tr><td>7</td><td>Calculate the equivalent resistance between A and B terminals.<br> 
</td><td>Understand</td><td>CO 1</td><td>AEEB01.03</td></tr>
<tr><td>8</td><td>Calculate equivalent resistance, source current, voltage drop and power dissipated in each resistor.<br><br><table><tr><td>element</td><td>From node</td><td>To node</td></tr><tr><td>20 V source</td><td>a</td><td>0</td></tr><tr><td>4 ohms</td><td>a</td><td>b</td></tr><tr><td>5 ohms</td><td>b</td><td>0</td></tr><tr><td>2 ohms</td><td>b</td><td>c</td></tr><tr><td>3 ohms</td><td>c</td><td>0</td></tr></table></td><td>Understand</td><td>CO 1</td><td>AEEB01.1</td></tr>
<tr><td>9</td><td>Calculate<br>a) The equivalent resistances across the terminals of the supply<br>b) Total current supplied by the source<br>c) Power delivered to 16 ohm resistor in circuit shown in figure shown below.<br> 
</td><td>Understand</td><td>CO 1</td><td>AEEB01.02</td></tr>
<tr><td>10</td><td>Calculate the power consumed by each resistor.<br> 
</td><td>Understand</td><td>CO 1</td><td>AEEB01.02</td></tr>
</table>

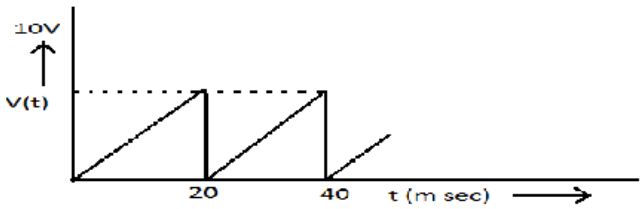
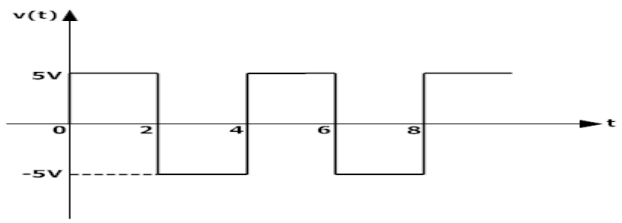
| | | | | |
|---|---|---|---|---|
| 11 | Calculate the equivalent capacitance of the combination shown figure below across X and Y.<br>  | Understand | CO 1 | AEEB01.02 |
| 12 | A capacitor having capacitance of 5μF is charged to a voltage of 10V. Calculate the stored energy in joules. | Remember | CO 1 | AEEB01.01 |
| 13 | Determine the current through 800 ohm resistor in the network shown in figure.<br>  | Understand | CO 1 | AEEB01.02 |
| 14 | Calculate power across each element in the given circuit.<br>  | Understand | CO 1 | AEEB01.02 |
| 15 | Calculate equivalent inductance in the given circuit.<br>  | Understand | CO 1 | AEEB01.02 |
| **MODULE-II** | | | | |
| **ANALYSIS OF ELECTRICAL CIRCUITS** | | | | |
| **Part – A (Short Answer Questions)** | | | | |
| 1 | Write the expressions of star to delta transformation. | Remember | CO 2 | AEEB01.05 |
| 2 | Write the expressions of delta to star transformation. | Remember | CO 2 | AEEB01.05 |
| 3 | Define super mesh. | Remember | CO 2 | AEEB01.06 |
| 4 | Give the condition for super node. | Understand | CO 2 | AEEB01.07 |
| 5 | Write the limitations of mesh analysis. | Remember | CO 2 | AEEB01.07 |
| 6 | Write the limitations of nodal analysis. | Remember | CO 2 | AEEB01.07 |

| | | | | |
|---|---|---|---|---|
| 7 | If three equal value resistors are in delta, determine their equivalent values in star connection. | Understand | CO 2 | AEEB01.08 |
| 8 | Define reference node. | Remember | CO 2 | AEEB01.09 |
| 9 | Give the difference between nodal analysis and mesh analysis. | Understand | CO 2 | AEEB01.06 |
| 10 | If three equal value resistors are in star, calculate their equivalent values in delta connection. | Understand | CO 2 | AEEB01.05 |
| 11 | If three equal value resistors with R= 3ohms are in delta, determine their equivalent values in star connection. | Understand | CO 2 | AEEB01.07 |
| 12 | If three equal value resistors with R=3ohm are in star , determine their equivalent values in delta connection | Understand | CO 2 | AEEB01.05 |
| 13 | State theveninn's theorem. | Remember | CO 2 | AEEB01.05 |
| 14 | State norton's theorem. | Remember | CO 2 | AEEB01.05 |
| 15 | Write limitations of norton's theorem. | Remember | CO 2 | AEEB01.05 |
| | **Part - B (Long Answer Questions)** | | | |
| 1 | Derive the expressions for equivalent resistances while transforming from star to delta and delta to star. | Understand | CO 2 | AEEB01.06 |
| 2 | Discuss the method used to determine loop currents for multiple loop network with an neat example. | Understand | CO 2 | AEEB01.05 |
| 3 | Summarize the procedure to calculate node voltages of an electrical network using nodal analysis. | Understand | CO 2 | AEEB01.08 |
| 4 | Discuss the method used to determine loop currents for multiple loop network with ideal current source between any two meshes. | Understand | CO 2 | AEEB01.07 |
| 5 | Summarize the procedure to calculate node voltages of an electrical network with ideal voltage source between any two nodes. | Understand | CO 2 | AEEB01.07 |
| 6 | Explain the inspection method to write mesh equation for a network. | Understand | CO 2 | AEEB01.08 |
| 7 | Explain the inspection method to write nodal equation for a network. | Understand | CO 2 | AEEB01.08 |
| 8 | Derive the expressions of star-delta transformations to determine the equivalent resistance of complex network. | Understand | CO 2 | AEEB01.09 |
| 9 | Explain mesh analysis with a neat example. | Understand | CO 2 | AEEB01.09 |
| 10 | Explain nodal analysis with a neat example. | Understand | CO 2 | AEEB01.07 |
| 11 | State and verify thevenin's theorem with an example for DC excitation. | Understand | CO 2 | AEEB01.07 |
| 12 | State and verify nortan's theorem with an example for DC excitation. | Understand | CO 2 | AEEB01.07 |
| 13 | Explain source transformation technique with a neat example. | Understand | CO 2 | AEEB01.07 |
| 14 | Explain steps to solve currents in thevenin's theorem. | Understand | CO 2 | AEEB01.09 |
| 15 | Explain steps to solve currents in nortons's theorem. | Understand | CO 2 | AEEB01.09 |
| | **Part - C (Problem Solving and Critical Thinking Questions)** | | | |
| 1 | Calculate the current flowing through 3 ohms resistor using Norton's theorem. If the circuit is as below.   | Understand | CO 2 | AEEB01.08 |

| | | | | |
|---|---|---|---|---|
| 2 | Calculate the current flowing through 3 ohms resistor using thevenin's theorem for the circuit is as below.<br>  | Understand | CO 2 | AEEB01.08 |
| 3 | Apply mesh analysis and calculate the current flowing through 3 Ohms element.<br>  | Understand | CO 2 | AEEB01.08 |
| 4 | Apply nodal analysis and determine the current flowing through each element.<br>  | Understand | CO 2 | AEEB01.08 |
| 5 | Determine the node voltages and power absorbed by 5 ohms resistor.<br>  | Understand | CO 2 | AEEB01.08 |
| 6 | Using inspection method, compute the current in each mesh and power loss in each element.<br>  | Understand | CO 2 | AEEB01.08 |

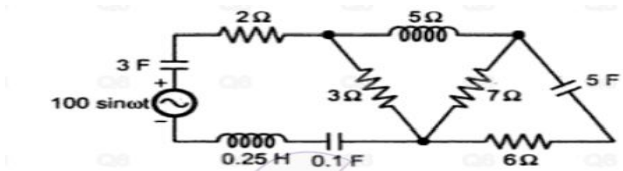
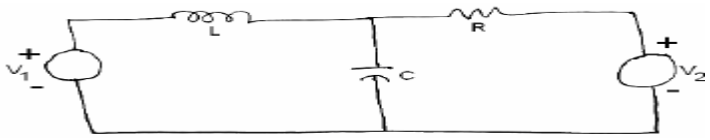
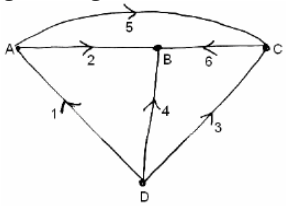
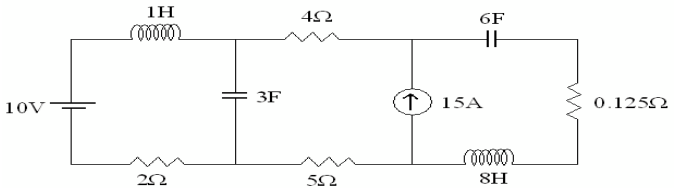
| | | | | |
|---|---|---|---|---|
| 7 | Using inspection method, calculate the node voltages and power loss in each element.<br>  | Understand | CO 2 | AEEB01.08 |
| 8 | Determine the node voltages using nodal analysis for given circuit shown below.<br>  | Understand | CO 2 | AEEB01.08 |
| 9 | Determine the current through branch a-b using mesh analysis shown in figure below.<br>  | Understand | CO 2 | AEEB01.09 |
| 10 | Apply mesh analysis and calculate the current flowing through each element.<br><br>Element \| From node \| To node<br>20 V source \| a \| 0<br>4 ohms \| a \| b<br>5 ohms \| b \| 0<br>2 ohms \| b \| c<br>3 ohms \| c \| 0<br>5 ohms \| c \| d<br>6 ohms \| d \| 0 | Understand | CO 2 | AEEB01.09 |
| 11 | Apply nodal analysis and calculate the current flowing through each element.<br><br>Element \| From node \| To node<br>30 V source \| a \| 0<br>4 ohms \| a \| b<br>5 ohms \| b \| 0<br>2 ohms \| b \| c<br>3 ohms \| c \| 0<br>5 ohms \| c \| d<br>6 ohms \| d \| 0 | Understand | CO 2 | AEEB01.09 |

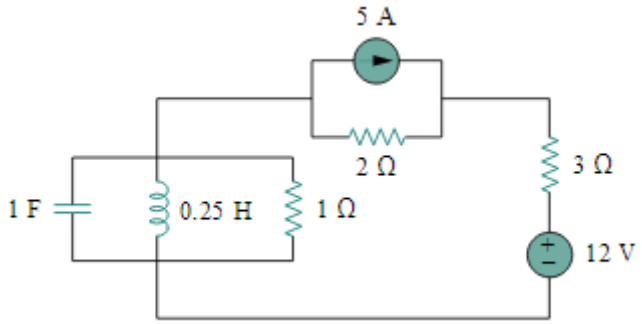
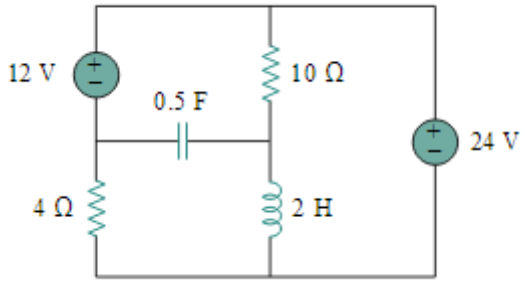
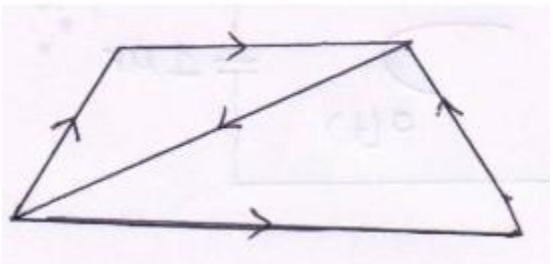
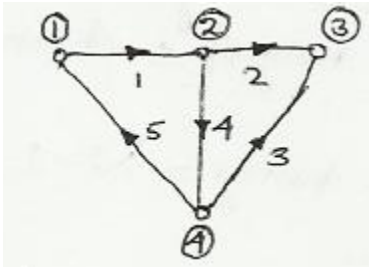
| | | | | |
|---|---|---|---|---|
| 12 | Calculate the node voltages and the power absorbed by 7 ohms resistor.<br><br>Element \| From node \| To node<br>40 V source \| a \| 0<br>10 ohms \| a \| b<br>8 ohms \| b \| 0<br>7 ohms \| b \| c<br>6 ohms \| b \| c<br>9 ohms \| c \| 0 | Understand | CO 2 | AEEB01.09 |
| 13 | In a circuit branch AB = 11 OHMS, BC = 20 OHMS, CD = 12 OHMS, BD = 8 ohms and DA = 15 OHMS and an source of 100V in series with 5 OHMS connected across A and C. Calculate the mesh currents. | Understand | CO 2 | AEEB01.09 |
| 14 | Apply mesh analysis and calculate the current above through each element.<br>  <br> | Understand | CO 2 | AEEB01.09 |
| 15 | Calculate the node voltages and the power absorbed by 7 ohms resistor.<br>  <br> | Understand | CO 2 | AEEB01.09 |
| | **MODULE -III** | | | |
| | **INTRODUCTION TO AC CIRCUITS** | | | |
| | **Part - A (Short Answer Questions)** | | | |
| 1 | Define the alternating quantity. | Remember | CO 3 | AEEB01.14 |
| 2 | Give the difference between periodic and non-periodic wave form. | Understand | CO 3 | AEEB01.14 |
| 3 | Define the peak, peak to peak, average, RMS value also peak and form factor of sine function. | Remember | CO 3 | AEEB01.14 |
| 4 | Represent the alternating current and voltage in terms of sine function. | Remember | CO 3 | AEEB01.14 |
| 5 | Write the expressions for voltage wave forms if wave form B lags wave form A by 30 degrees from reference axis. | Understand | CO 3 | AEEB01.14 |
| 6 | For the given alternating voltage, compute peak, peak to peak, average, RMS values. V(t) = 25 sin wt. | Understand | CO 3 | AEEB01.14 |
| 7 | Explain why average value is defined for half cycle of sine wave. | Understand | CO 3 | AEEB01.10 |
| 8 | In an AC circuit source applied is 100 sin100t across series combination of 4 ohms and 13 F, calculate source current flowing through circuit. | | | |
| | | | | |
| 9 | 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 | | |
| 10 | Write the expression for reactance offered by inductor and capacitor. | Remember | CO 3 | AEEB01.13 |
| 11 | Give the net impedance offered by commercial inductor and capacitor. | Understand | CO 3 | AEEB01.12 |
| 12 | Define the term admittance of circuit. | Remember | CO 3 | AEEB01.14 |
| 13 | If two impedances of (2 + 3j) ohms and (4+5j) ohms are in series, calculate the total impedance, and source current. | Understand | CO 3 | AEEB01.14 |
| 14 | Draw the impedance triangle and explain in detail. | Remember | CO 3 | AEEB01.14 |
| 15 | Define the term susceptance of circuit. | Remember | CO 3 | AEEB01.12 |

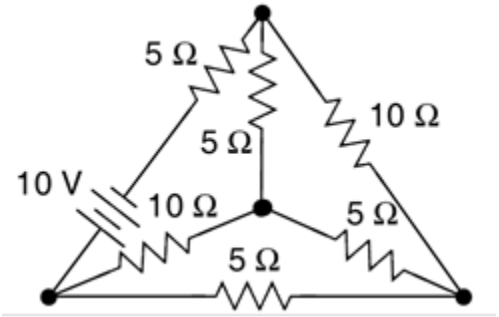
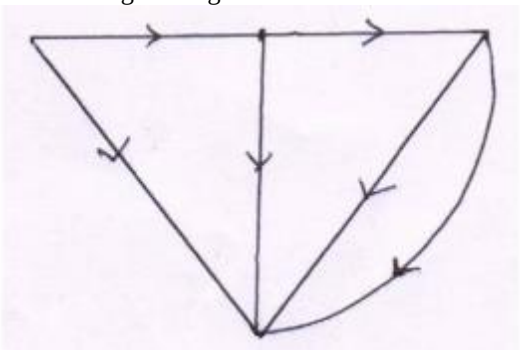
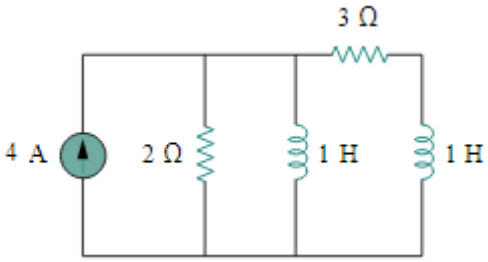
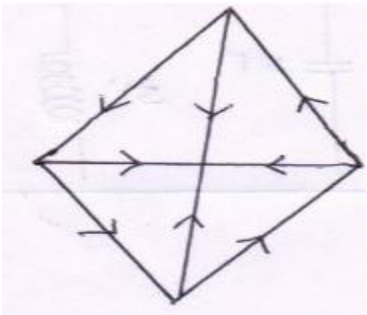
| | | | | |
|---|---|---|---|---|
| **Part – B (Long Answer Questions)** | | | | |
| 1 | Define the terms peak, peak to peak, average, RMS values, peak factor and form factor of sine wave. | Understand | CO 3 | AEEB01.14 |
| 2 | Derive the expression for average values of sine wave. | Understand | CO 3 | AEEB01.14 |
| 3 | Derive the expression for RMS values of sine wave. | Remember | CO 3 | AEEB01.14 |
| 4 | Summarize the features of electrical network with DC and AC excitation. | Understand | CO 3 | AEEB01.14 |
| 5 | Explain the nature of power factor in inductive and capacitive circuits. | Understand | CO 3 | AEEB01.14 |
| 6 | Compute all types of relations between two wave forms and write the relevant expressions. | Understand | CO 3 | AEEB01.13 |
| 7 | Derive the expression for form factor of sine wave. | Understand | CO 3 | AEEB01.11 |
| | | | | |
| 8 | Explain the terms phase, phase difference and phasor diagram with neat example. | Understand | CO 3 | AEEB01.11 |
| 9 | Derive the expressions for reactance and impedance of inductor and capacitor. | Understand | CO 3 | AEEB01.13 |
| 10 | Explain the concept of j notation. | Understand | CO 3 | AEEB01.13 |
| 11 | Discuss the concept of reactance and impedance offered by R, L, C parameters. | Understand | CO 3 | AEEB01.12 |
| 12 | Explain the conversion of polar to rectangular form. | Understand | CO 3 | AEEB01.12 |
| 13 | Explain the conversion of rectangular to polar form. | Understand | CO 3 | AEEB01.12 |
| 14 | Explain the concept of susceptance and admittance offered by R, L, C parameters. | Understand | CO 3 | AEEB01.12 |
| 15 | Explain admittance triangle in detail. | Understand | CO 3 | AEEB01.12 |
| **Part – C (Problem Solving and Critical Thinking)** | | | | |
| 1 | A sine wave has a frequency of 50 kHz. How many cycles does it complete in 20ms? | Understand | CO 3 | AEEB01.14 |
| 2 | A sine wave has a peak value of 25 V. Determine the following values a) rms b) peak to peak c) average | Understand | CO 3 | AEEB01.14 |
| 3 | The period of a sine wave is 20 milliseconds. What is the frequency? | Understand | CO 3 | AEEB01.14 |
| 4 | The frequency of a sine wave is 30 Hz. What is the period? | Understand | CO 3 | AEEB01.14 |
| 5 | A wire is carrying a direct current of 20A and a sinusoidal alternating current of peak value 20A. Find the RMS value of the resultant current in the wire. | Understand | CO 3 | AEEB01.14 |
| 6 | A sine wave has a frequency of 50kHz. How many cycles does it complete in 20ms? | Understand | CO 3 | AEEB01.14 |
| 7 | Find form factor and peak factor for a given waveform.   | Understand | CO 3 | AEEB01.14 |
| 8 | Find RMS value for a given waveform.   | Understand | CO 3 | AEEB01.14 |
| | | | | |
| 9 | A sinusoidal voltage applied to capacitor 0.01 μF. The frequency of sine wave is 2 kHz. Determine the capacitive reactance. | Understand | CO 3 | AEEB01.12 |
| 10 | A sinusoidal voltage applied to inductor 2mH. The frequency of sine wave is 3 kHz. Determine the inductive reactance. | Understand | CO 3 | AEEB01.12 |
| 11 | A 50 Ω, resistor is connected in parallel with an inductive reactance of 30 Ω. A 20V signal is applied to the circuit. Find the total impedance and line current in the circuit. | Understand | CO 3 | AEEB01.13 |

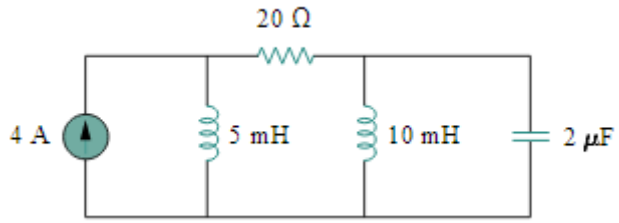
| | | | | |
|---|---|---|---|---|
| 12 | If the voltage applied is (10-8j) V and current flowing through circuit is (3–5j) A. Determine complex power and circuit constants. | Understand | CO 3 | AEEB01.13 |
| 13 | If R=100 Ω, and C=0.2μF are connected in parallel with 20V,5kHz Determine the total current, phase angle and total impedance of the circuits. | Understand | CO 3 | AEEB01.13 |
| 14 | A signal generator supplies a 30V, 100 Hz signal to circuit If R=10 Ω, L = 20mH, C=50 μF.determine the impedance, line current and phase angle. | Understand | CO 3 | AEEB01.13 |
| 15 | If R=25 Ω, L = 64mH, C=80μF are connected in series with 110V and find current, VR, VL and VC. | Understand | CO 3 | AEEB01.13 |
| **MODULE -IV** | | | | |
| **COMPLEX POWER ANALYSIS** | | | | |
| **Part – A (Short Answer Questions)** | | | | |
| 1 | Draw the power triangle for L. | Remember | CO 4 | AEEB01.15 |
| 2 | Draw the power triangle for C. | Understand | CO 4 | AEEB01.15 |
| 3 | Draw the power triangle for RL. | Remember | CO 4 | AEEB01.15 |
| 4 | Draw the power triangle for RC. | Remember | CO 4 | AEEB01.15 |
| 5 | Draw the power triangle for RLC. | Understand | CO 4 | AEEB01.15 |
| 6 | How do you calculate power factor? | Understand | CO 4 | AEEB01.15 |
| 7 | What is power factor and why is it important? | Understand | CO 4 | AEEB01.15 |
| 8 | What will happen if power factor is more than 1? | Understand | CO 4 | AEEB01.15 |
| 9 | What is the cause for power factor? | Understand | CO 4 | AEEB01.15 |
| 10 | What is the power factor formula? | Understand | CO 4 | AEEB01.15 |
| 11 | Define real power | Understand | CO 4 | AEEB01.16 |
| 12 | Define reactive power | Understand | CO 4 | AEEB01.17 |
| 13 | Define apparent power | Remember | CO 4 | AEEB01.19 |
| 14 | Define complex power | Understand | CO 4 | AEEB01.15 |
| 15 | Define power factor | Understand | CO 4 | AEEB01.15 |
| **Part – B (Long Answer Questions)** | | | | |
| 1 | Explain the concept of active, reactive, apparent power and draw power triangle for L. | Understand | CO 4 | AEEB01.15 |
| 2 | Explain the concept of active, reactive, apparent power and draw power triangle for C. | Understand | CO 4 | AEEB01.15 |
| 3 | Explain the concept of active, reactive, apparent power and draw power triangle for RL. | Understand | CO 4 | AEEB01.15 |
| 4 | Explain the concept of active, reactive, apparent power and draw power triangle RC. | Understand | CO 4 | AEEB01.15 |
| 5 | Explain the concept of active, reactive, apparent power and draw power triangle RLC. | Understand | CO 4 | AEEB01.16 |
| 6 | Co-relate the impedance triangle with power triangle and explain In detail. | Understand | CO 4 | AEEB01.17 |
| 7 | Co-relate the voltage triangle with power triangle and explain In detail. | Understand | CO 4 | AEEB01.17 |
| 8 | Derive the expression for true power in ac circuits. | Understand | CO 4 | AEEB01.17 |
| 9 | Predict the voltage, current and power in series RC circuit using sinusoidal excitation. | Understand | CO 4 | AEEB01.17 |
| 10 | Define the power factor of the circuit and give its importance. | Understand | CO 4 | AEEB01.15 |
| 11 | How do you convert kW to kVA? | Understand | CO 4 | AEEB01.15 |
| 12 | How do you convert kW to KVA? | Understand | CO 4 | AEEB01.19 |
| 13 | Why is apparent power greater than real power? | Understand | CO 4 | AEEB01.15 |
| 14 | What is the difference between active power, reactive power and apparent power? | Understand | CO 4 | AEEB01.15 |
| 15 | Explain about kVAR? | Understand | CO 4 | AEEB01.15 |
| **Part – C (Problem Solving and Critical Thinking)** | | | | |
| 1 | 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 active power, reactive power and apparent power and power factor of each branch and voltage drop across Z3<br>Z1= (8 + j) ohms<br>Z2= (1 + 6j) ohms<br>Z3= (3 + 5j) ohms. | Understand | CO 4 | AEEB01.17 |
| 2 | 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 active power, reactive power and apparent power and power factor of each branch and voltage drop across Z3. | Understand | CO 4 | AEEB01.17 |

| | | | | |
|---|---|---|---|---|
| | Z1= (3 + 2j) ohms<br>Z2= (4 + 5j) ohms<br>Z3= (2 + 4j) ohms. | | | |
| 3 | 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 4 | AEEB01.15 |
| 4 | If the voltage applied is (10+8j) V and current flowing through circuit is (3+5) A, calculate complex power and circuit constants. | Understand | CO 4 | AEEB01.17 |
| 5 | The voltage of a circuit is υ = 200 sin (wt + 300) and the current is i = 50 sin (wt + 600). Determine<br>i) The average power, reactive power and apparent power.<br>ii) The circuit elements if w =100π rad /sec. | Understand | CO 4 | AEEB01.17 |
| 6 | In an AC circuit source applied is v=100sin50t 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 4 | AEEB01.17 |
| 7 | For a series RL circuit with R=2kΩ and L=30mH. Determine total impedance Z, current I, phase angle voltage across the resistance VR and voltage across the inductor VL. | Understand | CO 4 | AEEB01.17 |
| 8 | A series RC circuit with f=50Hz, R=25kΩ and C=25μF. Determine total power and phase angle. | Understand | CO 4 | AEEB01.15 |
| 9 | A series RL circuit with f=50Hz, R=25kΩ and 0.2mH. Determine reactive power and phase angle. | Understand | CO 4 | AEEB01.15 |
| 10 | A series RLC circuit with f=50Hz, R=25kΩ, 0.2mH and C=25μF. Determine apparent and phase angle. | Understand | CO 4 | AEEB01.15 |
| 11 | A series RLC circuit with f=50Hz, R=25kΩ, 0.2mH and C=25μF. Determine power triangle and voltage triangle. | Understand | CO 4 | AEEB01.15 |
| 12 | A series RC circuit with f=50Hz, R=5kΩ and C=0.2μF. Determine total impedance Z, current I, phase angle, voltage across the resistance VR and voltage across the capacitance VC. | Understand | CO 4 | AEEB01.17 |
| 13 | Determine reactive power and phase angle of series RLC circuit with f=50Hz, R=10Ω, L=0.2mH and C=0.5μF. | Understand | CO 4 | AEEB01.17 |
| 14 | Determine active power and phase angle of series RLC circuit with f=50Hz, R=10Ω, L=0.2mH and C=0.5μF. | Understand | CO 4 | AEEB01.15 |
| 15 | Determine apparent power and phase angle of series RLC circuit with f=50Hz, R=10Ω, L=0.2mH and C=0.5μF. | Understand | CO 4 | AEEB01.15 |
| **MODULE –V** | | | | |
| **NETWORK TOPOLOGY** | | | | |
| **Part - A (Short Answer Questions)** | | | | |
| 1 | Define network topology and write its importance in electrical circuits. | Remember | CO 5 | AEEB01.20 |
| 2 | Define co-tree. | Remember | CO 5 | AEEB01.20 |
| 3 | Define tree. | Remember | CO 5 | AEEB01.20 |
| 4 | Give the properties of incidence matrix. | Remember | CO 5 | AEEB01.21 |
| 5 | Give the properties of tie-set matrix. | Remember | CO 5 | AEEB01.20 |
| 6 | Give the properties of cut-set matrix. | Remember | CO 5 | AEEB01.20 |
| 7 | Write the expression for number of links. | Remember | CO 5 | AEEB01.20 |
| 8 | For 8 elements 5 node graph, determine number of links. | Understand | CO 5 | AEEB01.20 |
| 9 | For 8 elements 5 links, determine number of node graphs. | Understand | CO 5 | AEEB01.20 |
| 10 | Define basic tie-set and give the condition to form basic tie-set. | Remember | CO 5 | AEEB01.20 |
| 11 | Define basic cut-set and give the condition to form basic cut-set. | Remember | CO 5 | AEEB01.20 |
| 12 | Define the duality and the dual elements. | Remember | CO 5 | AEEB01.20 |
| 13 | Give the importance of tie-set matrix with electrical networks. | Understand | CO 5 | AEEB01.20 |
| 14 | Give the importance of incident matrix with electrical networks. | Understand | CO 5 | AEEB01.20 |
| 15 | Give the importance of cut-set matrix with electrical networks. | Understand | CO 5 | AEEB01.22 |
| **Part - B (Long Answer Questions)** | | | | |
| 1 | Define terms graph, oriented and non-oriented graph, planar and non- planar. | Remember | CO 5 | AEEB01.20 |
| 2 | Explain the formation of incidence matrix with an example. | Understand | CO 5 | AEEB01.21 |
| 3 | Explain the formation of cut-set matrix with an example. | Understand | CO 5 | AEEB01.21 |
| 4 | Demonstrate the formation of matrix using tie-sets for the determination of relation between link currents and branch currents. | Understand | CO 5 | AEEB01.20 |
| 5 | Describe the method for the formation of matrix used to give relation between branch and twig voltages. | Understand | CO 5 | AEEB01.20 |

| | | | | |
|---|---|---|---|---|
| 6 | Explain the dual elements. | Understand | CO 5 | AEEB01.20 |
| 7 | Explain the dual network with neat example. | Understand | CO 5 | AEEB01.21 |
| 8 | Determine the branch currents in terms of link currents using tie-set matrix with an example. | Understand | CO 5 | AEEB01.21 |
| 9 | Determine the branch voltages in terms of twig voltages using cut-set matrix with an example. | Understand | CO 5 | AEEB01.22 |
| 10 | Take any graph and draw all possible trees, basic tie-sets. | Understand | CO 5 | AEEB01.22 |
| 11 | Take any graph and draw all possible trees and basic cut-sets. | Understand | CO 5 | AEEB01.22 |
| 12 | Take any graph, draw all possible trees and form incidence matrix for one tree. | Understand | CO 5 | AEEB01.22 |
| 13 | Derive the relation between twig voltages and branch voltages and write current equations. | Understand | CO 5 | AEEB01.20 |
| 14 | Define terms tree, co-tree, branches, links, nodes and degree of the node. | Remember | CO 5 | AEEB01.21 |
| 15 | Write list of properties of a Tree. | Understand | CO 5 | AEEB01.21 |
| | **Part – C (Problem Solving and Critical Thinking)** | | | |
| 1 | Draw the graph from incident matrix and write tie-set matrix<br>1 0 0 0 -1<br>-1 -1 -1 0 0<br>0 0 1 -1 0<br>0 1 0 1 1 | Understand | CO 5 | AEEB01.20 |
| 2 | Draw the graph from incident matrix and write cut-set matrix<br>1 0 0 0 -1<br>-1 -1 -1 0 0<br>0 0 1 -1 0<br>0 1 0 1 1 | Understand | CO 5 | AEEB01.20 |
| 3 | Draw the following<br>i. Graph<br>ii. Tree<br>iii. Dual network of figure shown below.<br>  | Understand | CO 5 | AEEB01.20 |
| 4 | Explain the principal of duality and draw the dual network.<br>  | Understand | CO 5 | AEEB01.22 |
| 5 | Determine the branch voltages using cut-set marix.<br>  | Understand | CO 5 | AEEB01.20 |
| 6 | Develop the fundamental tie-set matrix for the circuit shown in figure.<br>  | Understand | CO 5 | AEEB01.20 |

| | | | | |
|---|---|---|---|---|
| 7 | Draw the following<br>i. Graph<br>ii. Tree<br>iii. Dual network of figure shown below.<br>  | Understand | CO 5 | AEEB01.20 |
| 8 | Explain the principal of duality and draw the dual network.<br>  | Understand | CO 5 | AEEB01.20 |
| 9 | Determine the branch voltages using cut-set matrix.<br>  | Understand | CO 5 | AEEB01.20 |
| 10 | Develop the fundamental tie-set matrix for the circuit shown in figure.<br>  | Understand | CO 5 | AEEB01.20 |

| | | | | |
|---|---|---|---|---|
| 11 | Draw the following<br>i. Graph<br>ii. Tree<br>iii. Dual network of figure shown below.<br>  | Understand | CO 5 | AEEB01.20 |
| 12 | Determine the branch voltages using cut-set matrix.<br>  | Understand | CO 5 | AEEB01.20 |
| 13 | Explain the principal of duality and draw the dual network.<br>  | Understand | CO 5 | AEEB01.20 |
| 14 | Develop the fundamental tie-set matrix for the circuit shown in figure.<br>  | Understand | CO 5 | AEEB01.21 |

| | | | | |
|---|---|---|---|---|
| 15 | Draw the following<br>1. Graph<br>2. Tree<br>3. Dual network of figure shown below.<br>  <br> | Understand | CO 5 | AEEB01.21 |

**Prepared by:**
Mr. A Naresh Kumar, Assistant Professor

**HOD, CSE**