# INSTITUTE OF AERONAUTICAL ENGINEERING

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

## CIVIL ENGINEERING
## TUTORIAL QUESTION BANK

| | | |
|---|---|---|
| **Course Name** | : | **BASIC ELECTRICAL AND ELECTRONICS ENGINEERING** |
| **Course Code** | : | **AEE018** |
| **Class** | : | **II B. Tech I Semester (III Semester)** |
| **Branch** | : | **CIVIL ENGINEERING** |
| **Year** | : | **2018 – 2019** |
| **Course Coordinator** | : | Mr. N Shivaprasad, Assistant professor, EEE |
| **Course Faculty** | : | Dr. Hema Kumar, Assosiate Professor, EEE<br>Mr. A. Naresh Kumar, Assistant Professor, EEE |

### COURSE OBJECTIVES:
**The course should enable the students to:**

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| I | Understand Kirchhoff laws and their application in solving electric circuits. |
| II | Discuss the construction, principle and operation of measuring instruments. |
| III | Analyze the characteristics of alternating quantities, DC machines and AC machines. |
| IV | Illustrate the V-I characteristics of various diodes and bi-polar junction transistor. |

### COURSE LEARNING OUTCOMES:
**Students, who complete the course, will have demonstrated the ability to do the following:**

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| CAEE018.01 | Analyze the circuits using Kirchhoff's current law and Kirchhoff's voltage law. |
| CAEE018.02 | Use star delta transformation for simplifying complex circuits. |
| CAEE018.03 | Generalize operation and principle of measuring instruments. |
| CAEE018.04 | Demonstrate the working principle of DC motor, DC generator and transformer. |
| CAEE018.05 | Describe the construction of DC motor, DC generator and transformer. |
| CAEE018.06 | Classify the types of DC Generator and DC Motor and its applications. |
| CAEE018.07 | Derive the EMF equation of DC generator, transformer and torque equation of DC motor. |
| CAEE018.08 | Discuss the principle of operation of induction motor and its applications. |
| CAEE018.09 | Explain the construction and characteristics of alternator. |
| CAEE018.10 | Illustrate the generation of power in DC machines and AC machines. |

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| CAEE018.11 | Compare the operation of half wave, full wave and bridge rectifiers. |
| CAEE018.12 | Differentiate the operation and biasing of semiconductor devices like diodes and transistor. |
| CAEE018.13 | Apply the concept of diodes in converting AC to DC. |
| CAEE018.14 | Distinguish the different configurations of transistor. |
| CAEE018.15 | Examine the voltage, current and frequency of electric network using CRO. |
| CAEE018.16 | Apply the knowledge of electromagnetic laws and basic concepts of electronics. |
| CAEE018.17 | Process the knowledge and skills for employability and to succeed national and international level competitive examinations. |

**UNIT – I**

**ELECTRIC CIRCUITS, ELECTROMAGNETISM AND INSTRUMENTS**

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

| S No | QUESTION | Blooms Taxonomy Level | Course Learning Outcomes |
|---|---|---|---|
| 1 | State and explain the potential difference. | Remember | CAEE018.01 |
| 2 | Define current. | Remember | CAEE018.01 |
| 3 | Define resistance. | Remember | CAEE018.01 |
| 4 | Give the expression for voltage in terms of W and Q. | Understand | CAEE018.01 |
| 5 | Give the charge of an electron. | Understand | CAEE018.01 |
| 6 | State OHM's law. | Remember | CAEE018.01 |
| 7 | State Kirchhoff's current and Kirchhoff's voltage laws. | Remember | CAEE018.01 |
| 8 | Define the power and energy. | Remember | CAEE018.01 |
| 9 | Describe the active elements. | Remember | CAEE018.01 |
| 10 | Describe passive elements. | Remember | CAEE018.01 |
| 11 | Calculate the equivalent resistance of the circuit if applied voltage is 23V and current flowing through circuit is 4A, receiving a power of 92W. | Understand | CAEE018.01 |
| 12 | If the charge developed between two plates is 2C and capacitance is 4.5 F, calculate the voltage across the plates. | Understand | CAEE018.01 |
| 13 | If three capacitors are connected in series which are 2F, 3.2F and 6F calculate equivalent capacitance. | Understand | CAEE018.01 |
| 14 | If the three inductors are in parallel with 20mH, 25mH and 50mH, calculate the equivalent inductance. | Understand | CAEE018.01 |
| 15 | Define the inductance. | Remember | CAEE018.01 |
| 16 | Define the capacitance. | Remember | CAEE018.01 |
| 17 | Draw the symbols of different controlled sources. | Remember | CAEE018.01 |
| 18 | Describe measuring instrument. | Understand | CAEE018.03 |
| 19 | Write different types of torques in measuring instruments. | Understand | CAEE018.03 |
| 20 | Define controlling torque. | Remember | CAEE018.03 |
| 21 | Write short notes on spring control mechanism. | Remember | CAEE018.03 |
| 22 | Classify the types of measuring instruments. | Understand | CAEE018.03 |
| 23 | Define controlling torque. | Remember | CAEE018.03 |
| 24 | Define damping torque. | Remember | CAEE018.03 |

<table>
<tr><th colspan="4">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>CAEE018.01</td></tr>
<tr><td>3</td><td>Explain the Kirchhoff’s laws with example and neat diagrams.</td><td>Understand</td><td>CAEE018.01</td></tr>
<tr><td>4</td><td>Classify types of elements and explain in detail.</td><td>Understand</td><td>CAEE018.01</td></tr>
<tr><td>5</td><td>Distinguish between ideal and practical energy sources.</td><td>Understand</td><td>CAEE018.01</td></tr>
<tr><td>6</td><td>State Ohm’s law and give its applicability to electrical network. Explain convention current direction and voltage across an element.</td><td>Remember</td><td>CAEE018.01</td></tr>
<tr><td>7</td><td>Write the conventions to study any electrical circuit.</td><td>Remember</td><td>CAEE018.01</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>CAEE018.01</td></tr>
<tr><td>9</td><td>State voltage and current division rules and explain with neat example.</td><td>Remember</td><td>CAEE018.01</td></tr>
<tr><td>10</td><td>Derive the V-I relationship, power and energy stored in inductor.</td><td>Understand</td><td>CAEE018.01</td></tr>
<tr><td>11</td><td>Derive the V-I relationship, power and energy stored in capacitor.</td><td>Understand</td><td>CAEE018.01</td></tr>
<tr><td>12</td><td>Derive the equivalent resistance equations when they are connected in series and parallel.</td><td>Understand</td><td>CAEE018.01</td></tr>
<tr><td>13</td><td>Derive the equivalent inductance and capacitance equations when they are connected in series and parallel.</td><td>Understand</td><td>CAEE018.01</td></tr>
<tr><td>14</td><td>Derive the expressions for equivalent resistances while transforming from star to delta and delta to star.</td><td>Understand</td><td>CAEE018.02</td></tr>
<tr><td>16</td><td>Describe eddy current damping in measuring instruments.</td><td>Remember</td><td>CAEE018.03</td></tr>
<tr><td>17</td><td>Explain gravity control in measuring instruments.</td><td>Understand</td><td>CAEE018.03</td></tr>
<tr><td>18</td><td>Explain spring control in measuring instruments.</td><td>Understand</td><td>CAEE018.03</td></tr>
<tr><td>19</td><td>Discuss different types of torques produced in indicating instruments.</td><td>Understand</td><td>CAEE018.03</td></tr>
<tr><td>20</td><td>Describe working principle of moving iron repulsion type instrument.</td><td>Remember</td><td>CAEE018.03</td></tr>
<tr><td>21</td><td>Describe air friction damping in measuring instruments.</td><td>Remember</td><td>CAEE018.03</td></tr>
<tr><td>22</td><td>Explain working principle of permanent magnet moving coil instrument with neat diagram.</td><td>Understand</td><td>CAEE018.03</td></tr>
<tr><td>23</td><td>Describe working principle of moving iron attraction type instrument with neat diagram.</td><td>Remember</td><td>CAEE018.03</td></tr>
<tr><th colspan="4">Part - C (Analytical Questions)</th></tr>
<tr><td>1</td><td>Calculate the equivalent resistance and source current for the given data.
<table>
<tr><th>element</th><th>From node</th><th>To node</th></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>CAEE018.01</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>CAEE018.01</td></tr>
<tr><td>3</td><td>Use network reduction technique and calculate current response in each element.
<table>
<tr><th>element</th><th>From node</th><th>To node</th></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>CAEE018.01</td></tr>
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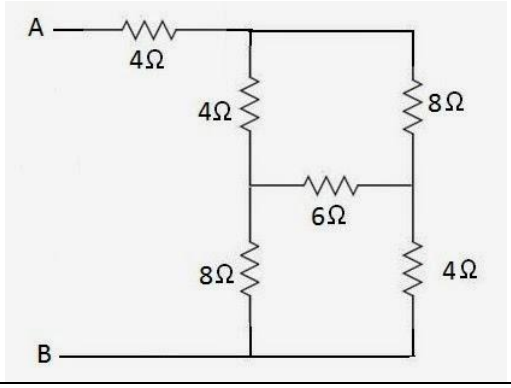
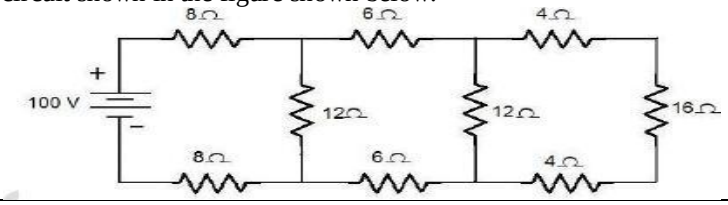
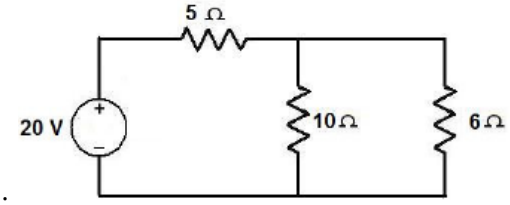
<tr><td>4</td><td>In a circuit branch AB = 10 ohm, BC = 20 ohm , CD = 15 ohm ,BD = 8 ohm and DA = 5 ohm and an source of 100V in series with 5ohm connected across A and C. Calculate equivalent resistance, source current and voltage drop across DA.</td><td>Understand</td><td>CAEE018.01</td></tr>
<tr><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 A and C. Calculate equivalent resistance, source current and voltage drop across DA.</td><td>Understand</td><td>CAEE018.01</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>CAEE018.01</td></tr>
<tr><td>7</td><td>Calculate the equivalent resistance between A and B terminals using star delta transformation.<br> 
</td><td>Understand</td><td>CAEE018.02</td></tr>
<tr><td>8</td><td>Calculate equivalent resistance, source current, voltage drop and power dissipated in each resistor.
<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>CAEE018.01</td></tr>
<tr><td>9</td><td>Calculate a) the equivalent resistances across the terminals of the supply, b) total current supplied by the source and c) power delivered to 16 ohm resistor in the circuit shown in the figure shown below.<br> 
</td><td>Understand</td><td>CAEE018.01</td></tr>
<tr><td>10</td><td>Calculate the power consumed by each resistor.<br> 

.</td><td>Understand</td><td>CAEE018.01</td></tr>
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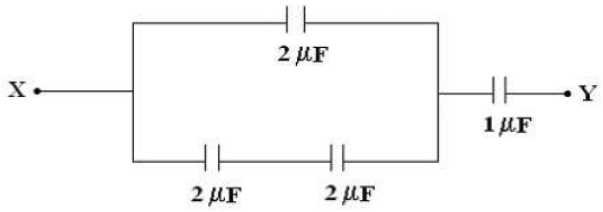
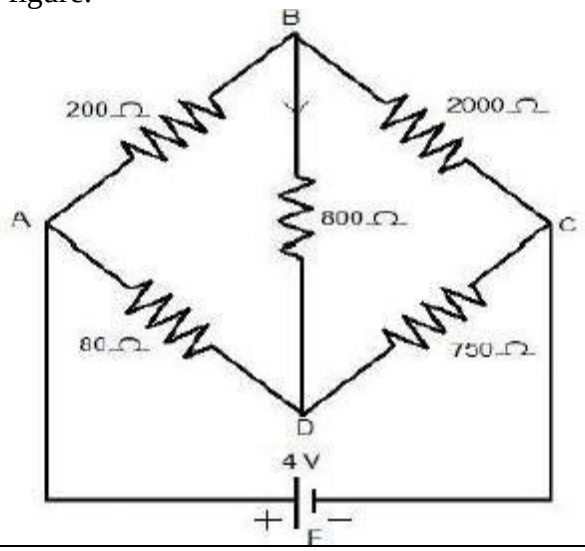
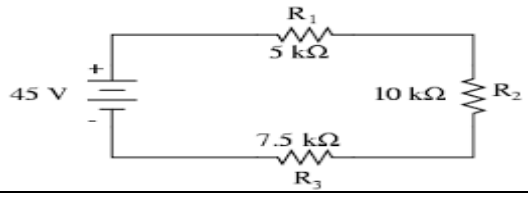
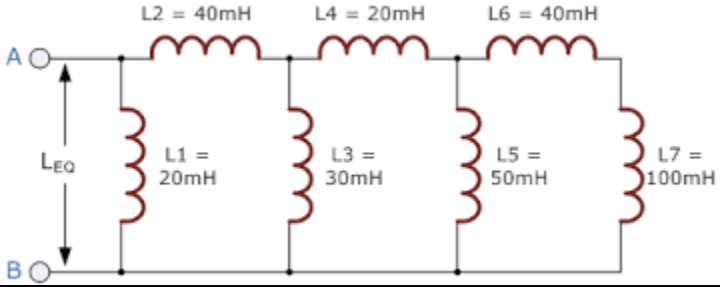
| 11 | Calculate the equivalent capacitance of the combination shown figure below across X and Y.<br>  | Understand | CAEE018.01 |
| 12 | A capacitor having capacitance of 5μF is charged to a voltage of 10V. Calculate the stored energy in joules. | Remember | CAEE018.01 |
| 13 | Determine the current through 800 ohm resistor in the network shown in figure.<br>  | Understand | CAEE018.02 |
| 14 | Calculate power across each element in the given circuit.<br>  | Understand | CAEE018.01 |
| 15 | Calculate equivalent inductance in the given circuit.<br>  | Understand | CAEE018.01 |
| **UNIT - II** | | | |
| **DC MACHINES** | | | |
| **Part – A (Short Answer Questions)** | | | |
| 1 | State Fleming's Right Hand Rule. | Remember | CAEE018.04 |
| 2 | Describe the basic principle of a DC generator. | Remember | CAEE018.04 |
| 3 | List the basic parts of a DC generator. | Remember | CAEE018.05 |

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| 4 | Classify the types of DC generators. | Remember | CAEE018.06 |
| 5 | Explain back EMF in DC motor. | Understand | CAEE018.05 |
| 6 | Draw the circuit diagram of a DC series motor. | Remember | CAEE018.06 |
| 7 | List the applications of DC motors. | Understand | CAEE018.07 |
| 8 | Describe function of commutator. | Understand | CAEE018.05 |
| 9 | Draw the open circuit characteristics of DC separately excited generator. | Remember | CAEE018.07 |
| 10 | Define residual EMF in a generator. | Understand | CAEE018.04 |
| 11 | State Faraday's laws of electromagnetic induction. | Remember | CAEE018.04 |
| 12 | State Fleming's left hand rule. | Remember | CAEE018.04 |
| 13 | Write the voltage, armature current and power equation of DC shunt motor. | Remember | CAEE018.04 |
| 14 | Explain functions of yoke. | Understand | CAEE018.05 |
| 15 | Explain the function of brush in DC machines. | Understand | CAEE018.05 |
| **Part - B (Long Answer Questions)** | | | |
| 1 | Describe the construction of DC machine with neat diagram. | Remember | CAEE018.05 |
| 2 | Discuss the principle of operation of DC generator. | Understand | CAEE018.04 |
| 3 | Derive the equation for induced EMF of a DC machine. | Understand | CAEE018.07 |
| 4 | Explain the principle of operation of DC Motor. | Understand | CAEE018.04 |
| 5 | Give the classification of DC generator and explain with neat diagrams. | Remember | CAEE018.06 |
| 6 | Derive the torque equation of DC motor. | Understand | CAEE018.07 |
| 7 | Discuss different types of characteristics of different types of generators. | Understand | CAEE018.07 |
| 8 | Explain three point starter for DC Shunt motor. | Understand | CAEE018.07 |
| 9 | Differentiate between self-excited and separately excited DC machines. | Understand | CAEE018.06 |
| 10 | Discuss Different types of characteristics of DC motors. | Understand | CAEE018.07 |
| 11 | Explain the windings used in DC machines. | Remember | CAEE018.05 |
| 12 | Explain the open circuit characteristics of DC shunt generator. | Understand | CAEE018.07 |
| 13 | Explain single loop generator with commutator. | Remember | CAEE018.07 |
| 14 | Give the classification of DC motors and explain with neat diagrams. | Understand | CAEE018.06 |
| 15 | Explain lap winding in DC machines with neat sketch. | Understand | CAEE018.05 |
| **Part - C (Analytical Questions)** | | | |
| 1 | Calculate the EMF by 4 pole wave wound generator having 65 slots with 12 conductors per slot when driven at 1200 rpm the flux per pole is 0.02 Wb. | Understand | CAEE018.07 |
| 2 | A 6 pole lap wound DC generator has 600 conductors on its armature flux per pole is 0.02 Wb. Calculate<br>1. The speed at which the generator must be run to generate 300V<br>2. What would be the speed if the generated were wave wound. | Understand | CAEE018.07 |
| 3 | An 8-pole, lap wound armature rotated at 350 rpm is required to generate 260v. The useful flux per pole is 0.05Wb if the armature has 120 slots, calculate the number of conductors per slot. | Understand | CAEE018.07 |
| 4 | A 440V DC shunt generator has Ra=0.25 ohm and Rsh= 220 ohm while delivering a load current of 50 amps, it has a terminal voltage of 440v determined the generated EMF and power developed. | Understand | CAEE018.07 |

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| 5 | A DC series generator has armature resistance of 0.5 ohm and series field resistance of 0.03 ohm it drives a load of 50 amps. if it has 6 turns/coil and total 540 coils on the armature and is driven at 1500 rpm calculate the terminal voltage at the load. Assume 4-poles, lap type winding, flux pole as 2mWb and total brush drop as 2V. | Understand | CAEE018.07 |
| 6 | A 4-pole lap wound DC shunt generator has a useful flux per pole of 0.07Wb The armature winding consists of 220 turns, each of 004ohm resistance. Calculate the terminal voltage when running at 900 rpm if the armature current is 50amps. | Understand | CAEE018.07 |
| 7 | A shunt generator supplies 96amps at a terminal voltage of 200volts the armature and shunt field resistances are 0.1ohm and 50ohm respectively. The iron and frictional losses are 2500 watts. Find i) EMF generated ii) copper losses. | Understand | CAEE018.07 |
| 8 | A 250 v shunt motor takes a total current of 20amps the shunt field and armature resistances are 200ohm and 0.3ohm respectively determine i) Value of back EMF ii) gross mechanical power in the armature. | Understand | CAEE018.07 |
| 9 | Calculate the value of torque established by the armature of a 4 pole motor having 774 conductors, two paths in parallel, 24mWb flux per pole , when the total armature current is 50amps. | Understand | CAEE018.07 |
| 10 | A 230V DC shunt motor takes a current of 40 amps and runs at 1100 rpm if armature and shunt field resistances are 0.25 ohm and 230 ohm respectively. Find the torque developed by armature. | Understand | CAEE018.07 |
| 11 | Calculate the EMF by 6 pole wave wound generator having 75 slots with 6 conductors per slot when driven at 1200 rpm the flux per pole is 0.03 Wb. | Understand | CAEE018.07 |
| 12 | An 8-pole, lap wound armature rotated at 450 rpm is required to generate 250v. The useful flux per pole is 0.06 Wb if the armature has 100 slots, calculate the number of conductors per slot. | Understand | CAEE018.07 |
| 12 | A 220v DC shunt generator has Ra=0.35 ohm and Rsh= 200 ohm while delivering a load current of 50 amps, it has a terminal voltage of 220V determine the generated EMF and power developed. | Understand | CAEE018.07 |
| 13 | A 6-pole lap wound DC shunt generator has a useful flux per pole of 0.06 Wb. The armature winding consists of 220 turns, each of 0.06 ohm resistance. Calculate the terminal voltage when running at 1000 rpm if the armature current is 40 amps. | Understand | CAEE018.07 |
| 14 | A 220v DC shunt motor takes a current of 20 amps and runs at 1200 rpm if armature and shunt field resistances are 0.35 ohm and 200 ohm respectively Find the torque developed by armature. | Understand | CAEE018.07 |
| 15 | A 6-pole, lap wound armature rotated at 550 rpm is required to generate 250v. The useful flux per pole is 0.05 wb if the armature has 100 slots, calculate the number of conductors per slot. | Understand | CAEE018.07 |
| **UNIT – III** | | | |
| **ALTERNATING QUANTITIES AND AC MACHINES** | | | |
| **Part – A (Short Answer Questions)** | | | |
| 1 | Mention the difference between core and shell type transformers. | Understand | CAEE018.04 |
| 2 | Give the EMF equation of a transformer and define each term. | Remember | CAEE018.07 |
| 3 | Define voltage regulation of a transformer. | Understand | CAEE018.07 |
| 4 | Define transformation ratio. | Remember | CAEE018.07 |
| 5 | Classify induction motors based on construction. | Understand | CAEE018.08 |
| 6 | Derive maximum torque condition under running condition. | Understand | CAEE018.08 |
| 7 | Draw torque slip characteristics of three phase induction motor. | Understand | CAEE018.08 |
| 8 | List the types of Alternator based on rotor construction. | Understand | CAEE018.09 |
| 9 | Define voltage regulation of an alternator. | Understand | CAEE018.09 |
| 10 | Define efficiency of a transformer. | Remember | CAEE018.04 |

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| 11 | Describe the functions of transformer. | Understand | CAEE018.04 |
| 12 | Classify the losses of transformer. | Remember | CAEE018.07 |
| 13 | Write the expression for eddy current losses and define each term. | Understand | CAEE018.07 |
| 14 | Write the expression for hysteresis losses and define each term. | Understand | CAEE018.07 |
| 15 | Write the EMF equation of alternator. | Remember | CAEE018.10 |
| 16 | Define form factor of a sinusoidal signal . | Remember | CAEE018.01 |
| 17 | Define average value of a sinusoidal signal. | Remember | CAEE018.01 |
| 18 | Define RMS Value of a sinusoidal signal. | Remember | CAEE018.01 |
| 19 | Define peak factor of a sinusoidal signal. | Remember | CAEE018.01 |
| | **Part – B (Long Answer Questions)** | | |
| 1 | Describe the construction details of single phase transformer. | Understand | CAEE018.05 |
| 2 | Explain the principle of operation of transformer. | Understand | CAEE018.04 |
| 3 | Derive the EMF equation of a transformer. | Remember | CAEE018.07 |
| 4 | Discuss about different types of losses in transformer. | Understand | CAEE018.05 |
| 5 | Describe the method to perform OC and SC test on a transformer. | Understand | CAEE018.05 |
| 6 | Discuss the principle and operation of three phase induction motor. | Understand | CAEE018.08 |
| 7 | Discuss about Different types of Induction motors depends upon the rotor construction. | Understand | CAEE018.08 |
| 8 | Derive maximum torque condition under running and standstill condition of induction motor. | Understand | CAEE018.08 |
| 9 | Describe the construction of alternator depends upon rotor construction. | Understand | CAEE018.09 |
| 10 | Discuss synchronous impedance method to find regulation of an alternator. | Understand | CAEE018.10 |
| 11 | Draw the torque slip characteristics of induction motor. | Understand | CAEE018.08 |
| 12 | Explain the working principle of alternator. | Remember | CAEE018.09 |
| 13 | Derive average, RMS, form and peak factors of a sinusoidal signal. | Understand | CAEE018.01 |
| 14 | Explain concept of three phase alternating quantity. | Understand | CAEE018.01 |
| | **Part - C (Analytical Questions)** | | |
| 1 | A transformer supplied a load of 32A at 415V. If the primary voltage is 3320V, find the following: (a) Secondary volt ampere (b) Primary current (c) Primary volt ampere. Neglect losses and magnetizing current. | Understand | CAEE018.07 |
| 2 | A 125 KVA transformer having primary voltage of 2000V at 50 Hz has 182 primary and 40 secondary turns. Neglecting losses, calculate i) The full load primary and secondary currents. ii) The no-load secondary induced emf. iii) Maximum flux in the core. | Understand | CAEE018.07 |
| 3 | A single phase transformer has 50 primary and 1000 secondary turns. Net cross sectional area of the core is 500 cm2. If the primary winding is connected to 50 Hz supply at 400 V, Calculate the value of Maximum flux density on core and the emf induced in the secondary. | Understand | CAEE018.07 |
| 4 | A transformer with 40 turns on the high voltage winding is used to step down the voltage from 240V to 120V. Find the number of turns in the low voltage winding. Open circuit and short circuit tests on a 5 KVA, 220/400V, 50 Hz, single phase transformer gave the following results: OC Test: 220V, 2A, 100W (lv side), SC Test: 40V, 11.4A, 200W ( hv side) Obtain the equivalent circuit. | Understand | CAEE018.07 |
| 5 | The efficiency of a 400 kva ,single phase transformer is 98.77% when delivering full-load at 0.8 pf lagging and 99.13% at half load at unity power factor calculate i) iron losses and full load copper losses. | Understand | CAEE018.05 |

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| 6 | A 440/110 v transformer has a primary resistance of 0.03 ohms and secondary resistance of 0.02 ohms if iron losses at normal input is 150 watts determine the secondary current at which maximum efficiency will occur and the value of this maximum efficiency at a unity power factor load. | Understand | CAEE018.05 |
| 7 | A 4 – pole 3 phase star connected alternator armature has 12 slots with 24 conductors per slot and the flux per pole is 0.1 Wb. Calculate line emf generated at 50 Hz. Calculate the distribution factor of a 36 slot, 4 pole single layer winding of an alternator. | Understand | CAEE018.09 |
| 8 | A part of an alternator winding consists of six coils in series, each coil having an emf of 10V rms Induced in it. The coils are placed in successive slots and between each slot and the next; there is an Electrical phase displacement of 30 degrees. Calculate the emf of the six coils in series. | Understand | CAEE018.09 |
| 9 | In case of an 8-pole induction motor the supply frequency was 50 Hz and the shaft speed was 735 rpm. Compute i) Synchronous speed ii) Slip speed per unit slip iii)Percentage slip. | Understand | CAEE018.08 |
| 10 | A 6-pole, 50Hz squirrel cage induction motor runs on load at a shaft speed of 970 rpm. Calculate i) Percentage slip ii) The frequency of the induced current in the rotor. | Understand | CAEE018.08 |
| 11 | A single phase transformer has 50 primary and 1000 secondary turns. Net cross sectional area of the core is 400 cm2. If the primary winding is connected to 50 Hz supply at 400 V, Calculate the value of Maximum flux density on core and the emf induced in the secondary. | Understand | CAEE018.07 |
| 12 | A 125 KVA transformer having primary voltage of 2200V at 50 Hz has 180 primary and 40 secondary turns. Neglecting losses, calculate i) The full load primary and secondary currents. ii) The no-load secondary induced emf. Iii) Maximum flux in the core. | Understand | CAEE018.07 |
| 13 | A transformer supplied a load of 20A at 230V. If the primary voltage is 2300V,find the following: (a) Secondary volt ampere (b) Primary current (c) Primary volt ampere. Neglect losses and magnetizing current. | Understand | CAEE018.07 |
| 14 | In case of an 6-pole induction motor the supply frequency was 50 Hz and the shaft speed was 925 rpm. Compute i) Synchronous speed ii) Slip speed per unit slip iii)Percentage slip. | Understand | CAEE018.08 |
| 15 | A 4-pole, 50Hz squirrel cage induction motor runs on load at a shaft speed of 1440 rpm. Calculate i) Percentage slip ii) The frequency of the induced current in the rotor. | Understand | CAEE018.08 |
| **UNIT-IV** | | | |
| **SEMICONDUCTOR DIODE AND APPLICATIONS** | | | |
| **Part – A (Short Answer Questions)** | | | |
| 1 | Define semiconductor. | Understand | CAEE018.12 |
| 2 | Explain forward bias of diode. | Remember | CAEE018.12 |
| 3 | Explain reverse bias of diode. | Remember | CAEE018.12 |
| 4 | Write the Applications of diode. | Understand | CAEE018.12 |
| 5 | Draw the V-I characteristics of diode. | Understand | CAEE018.12 |
| 6 | Differentiate intrinsic and extrinsic semiconductors. | Understand | CAEE018.12 |
| 7 | Explain avalanche breakdown. | Understand | CAEE018.12 |
| 8 | Draw the characteristics of zener diode. | Understand | CAEE018.12 |
| 9 | Discuss the importance of cut in voltage. | Understand | CAEE018.12 |
| 10 | Define transformer utility factor. | Understand | CAEE018.07 |
| 11 | Explain majority and minority carriers in a semiconductor. | Understand | CAEE018.12 |
| 12 | Define efficiency. | Remember | CAEE018.13 |
| 13 | Define form factor. | Understand | CAEE018.13 |
| 14 | Define peak inverse voltage. | Understand | CAEE018.13 |

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| 15 | Define ripple factor. | Understand | CAEE018.13 |
| 16 | Write the equation of diode current. | Understand | CAEE018.13 |
| 17 | Define rectifier. | Understand | CAEE018.13 |
| 18 | Define regulator. | Understand | CAEE018.12 |
| **Part – B (Long Answer Questions)** | | | |
| 1 | Explain the theory of PN junction in semiconductors and explain how it acts as diode. | Understand | CAEE018.12 |
| 2 | Explain the operation of PN junction diode in forward bias and reverse bias. | Understand | CAEE018.12 |
| 3 | Explain how zener diode is used as voltage regulator. | Understand | CAEE018.13 |
| 4 | Describe the diode current equation. | Remember | CAEE018.12 |
| 5 | Analyze the effect of temperature on the volt –ampere characteristics of a diode. | Understand | CAEE018.12 |
| 6 | Define rectifier. Describe average and RMS values for output voltage in half wave rectifier. | Understand | CAEE018.12 |
| 6 | Describe average and RMS values for output voltage in centre tapped full wave rectifier. | Understand | CAEE018.12 |
| 7 | Explain how diode acts as switch. | Understand | CAEE018.13 |
| 8 | Explain zener and avalanche breakdown mechanisms in detail. | Understand | CAEE018.13 |
| 9 | Explain the relative merits and demerits of all the rectifiers. | Understand | CAEE018.13 |
| 10 | Describe potential energy barrier of the p-n junction? How does it arise and what is its order of magnitude. | Understand | CAEE018.12 |
| 11 | Sketch the V-I characteristics of p-n junction diode for forward bias voltages. Analyze between the incremental resistance and the apparent resistance of the diode. | Understand | CAEE018.12 |
| 12 | Explain the V-I characteristics of Zener diode and Analyze between avalanche and zener break downs. | Understand | CAEE018.12 |
| 13 | Explain in detail, the variation of following semiconductor parameters with temperature, i) Energy gap ii) Conductivity. | Understand | CAEE018.13 |
| 14 | List out the merits and demerits of Bridge type Full Wave rectifiers over centre tapped type Full Wave rectifiers. | Understand | CAEE018.11 |
| 15 | Explain the working of centre-tapped full wave rectifier with suitable diagrams. Derive expressions for $V_{DC}$, $I_{DC}$, $V_{rms}$ and $I_{rms}$. | Understand | CAEE018.11 |
| **Part - C (Analytical Questions)** | | | |
| 1 | A full wave bridge rectifier having load resistance of 100Ω is fed with 220V, 50Hz through a step-down transformer of turn's ratio 11:1. Assuming the diodes ideal, calculate i) DC output voltage ii) Peak inverse voltage iii) Rectifier efficiency. | Understand | CAEE018.13 |
| 2 | A 230 V, 60Hz voltage is applied to the primary of a 5:1 step down, center tapped transformer used in a full wave rectifier having a load of 900Ω. If the diode resistance and the secondary coil resistance together have a resistance of 100 Ω, calculate i) DC voltage across the load. ii)DC current flowing through the load. iii) DC power delivered to the load. v) PIV across each diode. | Understand | CAEE018.13 |
| 3 | Calculate the values of forward current in the case of PN junction diode, with $I_0$=10μA $V_f$ = 0.8V at T=300$^0$K Assume Si diode. | Understand | CAEE018.12 |
| 4 | A HWR circuit supplies 100mA DC current to a 250Ω load. Calculate the DC output voltage, PIV rating of a diode and the r.m.s. voltage for the transformer supplying the rectifier. | Understand | CAEE018.13 |
| 5 | A full wave rectifier circuit uses two silicon diodes with a forward resistance of 20Ω each. A DC voltmeter connected across the load of 1KΩ reads 55.4 volts. Calculate i) Irms ii) Average voltage across each diode iii) ripple factor iv) Transformer secondary voltage rating. | Understand | CAEE018.13 |

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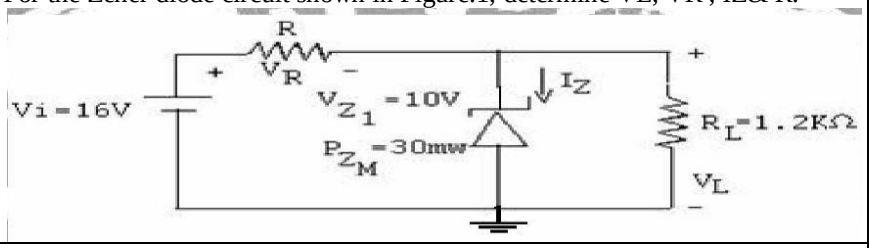
| 6 | What is the ripple factor if a power supply of 220 V, 50 Hz is to be Full Wave rectified and filtered with a 220μF capacitor before delivering to a resistive load of 120Ω? Calculate the value of the capacitor for the ripple factor to be less than 15%. | Understand | CAEE018.13 |
| 7 | A bridge rectifier uses four identical diodes having forward resistance of 5Ω each. Transformer secondary resistance is 5Ω and the secondary voltage of 30V (rms). Calculate the dc output voltage for IDC=200mA and the value of the ripple voltage. | Understand | CAEE018.13 |
| 8 | In a Zener diode regulator, the supply voltage = 300V, Vz= 220V, Iz= 15mA and load current = 25mA. Calculate the value of resistor required to be connected in series with the Zener diode. | Understand | CAEE018.12 |
| 9 | Calculate the value of D.C. resistance and A.C resistance of a Germanium junction diode at $25^0$C with reverse saturation current, $I_o$= 25μA and at an applied voltage of 0.2V across the diode. | Understand | CAEE018.13 |
| 10 | The reverse saturation current of a silicon p –n junction diode at an operating temperature of $27^0$C is 50 nA. Calculate the dynamic forward and reverse resistances of the diode for applied voltages of 0.8 V and -0.4 V respectively. | Understand | CAEE018.13 |
| 11 | For the Zener diode circuit shown in Figure.1, determine VL, VR , IZ& R.   | Understand | CAEE018.13 |
| 12 | In a Zener diode regulator, the supply voltage = 300V, Vz = 220V, Iz = 15mA and load current = 25mA. Determine the value of resistor required to be connected in series with the Zener diode. | Understand | CAEE018.12 |
| 13 | In a full wave rectifier, the input is from 30-0-30V transformer. The load and diode forward resistances are 100Ω and 10Ω respectively. Calculate the average voltage, dc output power, ac input power, rectification efficiency and percentage regulation. | Understand | CAEE018.11 |
| 14 | With a neat circuit diagram and waveforms explain the working of full wave bridge rectifier and show that its ripple factor is 0.48. | Understand | CAEE018.11 |
| 15 | Design Zener voltage regulator for the following specifications: Input Voltage=10V±20%, Output Voltage=5V, $I_L$=20mA, $I_{zmin}$=5mA and $I_{zmax}$=80mA. | Understand | CAEE018.12 |

**UNIT-V**

**BIPOLAR JUNCTION TRANSISTOR AND APPLICATIONS**

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

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| 1 | Define transistor. | Understand | CAEE018.13 |
| 2 | Describe the operating point of transistor. | Understand | CAEE018.13 |
| 3 | Draw the symbols of NPN and PNP transistor. | Remember | CAEE018.13 |
| 4 | Explain the operation of BJT and its types. | Remember | CAEE018.13 |
| 5 | Explain the breakdown in transistor. | Understand | CAEE018.13 |
| 6 | Define transistor current. | Understand | CAEE018.13 |
| 7 | Describe how a transistor acts as a switch. | Understand | CAEE018.14 |
| 8 | Define saturation region. | Remember | CAEE018.13 |
| 9 | Define active region. | Remember | CAEE018.13 |
| 10 | Write the relation between $I_C$, β, $I_B$ and $I_{CBO}$ in a BJT. | Understand | CAEE018.14 |
| 11 | Define amplifier. | Understand | CAEE018.13 |

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| 12 | Define Biasing. | Understand | CAEE018.14 |
| 13 | Define current amplification factor. | Understand | CAEE018.13 |
| 14 | Explain about the various regions in a transistor. | Understand | CAEE018.14 |
| 15 | Draw and explain the ac load line. | Understand | CAEE018.13 |
| 16 | Discuss why biasing is necessary in BJT amplifiers. | Understand | CAEE018.14 |
| 17 | Define cut-off region in transistor characteristics. | Understand | CAEE018.14 |
| 18 | Write a short note on transistor construction. | Understand | CAEE018.14 |
| 19 | Design a circuit and explain the working of a transistor as a switch. | Understand | CAEE018.14 |
| 20 | Explain the concept of DC load line with the help of neat diagram. | Remember | CAEE018.14 |
| **Part - B (Long Answer Questions)** | | | |
| 1 | Explain the operation of NPN and PNP transistor. | Remember | CAEE018.13 |
| 2 | Illustrate with a diagram, how the BJT transistor acts as an amplifier. | Understand | CAEE018.13 |
| 3 | Explain the working of a transistor as an amplifier. | Remember | CAEE018.13 |
| 4 | Explain the term α and β current gains and their relationship for N-P-N transistor. | Remember | CAEE018.13 |
| 5 | Draw the input and output characteristics of a transistor in common emitter configurations. | Understand | CAEE018.14 |
| 6 | Explain the constructional details of Bipolar Junction Transistor. | Understand | CAEE018.13 |
| 7 | Describe the significance of the terms, α and β. Establish a relation between them. | Understand | CAEE018.13 |
| 8 | Derive the relation among α, β and γ in CE configuration. | Understand | CAEE018.14 |
| 9 | Determine the significance of operating point, DC and AC load lines to ensure active region operation of a BJT in CE amplifier. | Understand | CAEE018.14 |
| 10 | Explain the concept of ac and dc load line with the help of neat diagram. | Remember | CAEE018.14 |
| 11 | Draw the common emitter circuit and sketch the input and output characteristics Also explain active region, cutoff region and saturation region by indicating them on the characteristic curve. | Understand | CAEE018.14 |
| 12 | Give the relationship between α, β and γ of a transistor in CC configuration. | Understand | CAEE018.14 |
| 13 | Explain the input and output characteristics of a transistor in CB configuration. | Remember | CAEE018.14 |
| 14 | Explain the input and output characteristics of a transistor in CE configuration. | Remember | CAEE018.14 |
| 15 | Explain the input and output characteristics of a transistor in CC configuration. | Remember | CAEE018.14 |
| **Part - C (Analytical Questions)** | | | |
| 1 | Calculate the values of $I_C$ and $I_E$ for a transistor with $\alpha_{dc}$ = 0.99 and $I_{CBO}$ =5μA, if $I_B$ is measured as 20μA? | Understand | CAEE018.14 |
| 2 | Determine the collector current and emitter current for a transistor with α = 0.99 and $I_{CBO}$= 490μA when the base current is 19μA | Understand | CAEE018.13 |
| 3 | The reverse leakage current of the transistor when connected in CB configuration is 0.2μA while it is 18μA when the same transistor is connected in CE configuration. Calculate α and β of the transistor? | Understand | CAEE018.14 |
| 4 | For an NPN transistor with $\alpha_N$= 0.98, $I_{CO}$= 2μA and $I_{EO}$= 1.6μA connected in Common Emitter Configuration, Determine the minimum base current for which the transistor enters into saturation region. VCC and load resistance are given as12 V and 4.0 KΩ respectively. | Understand | CAEE018.14 |
| 5 | If the base current in a transistor is 20μA when the emitter current is 6.4mA, what are the values of $\alpha_{dc}$ and $\beta_{dc}$? Also determine the collector current. | Understand | CAEE018.14 |
| 6 | In a certain transistor, the emitter current is 1.02 times as large as the collector current. If the emitter current is 12 mA, Calculate the base current. | Understand | CAEE018.14 |

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| 7 | A) Calculate $\alpha_{dc}$, For each of the following values of $\beta_{dc}$=50 and 190.<br>B) Calculate $\beta_{dc}$ for each of the following values of $\alpha_{dc}$=0.995 and 0.9765. | Understand | CAEE018.13 |
| 8 | In a certain transistor, the emitter current is 1.09 times as large as the collector current. If the emitter current is 10 mA, Calculate the base current. | Understand | CAEE018.13 |
| 9 | In a Common Emitter transistor circuit if $\beta$ = 100 and IB = 50μA, compute the values of $\alpha$, $I_E$ and $I_C$. | Understand | CAEE018.14 |
| 10 | Find the value of $\beta$ if $\alpha$ = 0.9.(where $\alpha$ and $\beta$ are current amplification factor in Common Emitter configuration. | Understand | CAEE018.13 |
| 11 | Derive the relationship between $\alpha$ and $\beta$. Calculate the value of Ic, Ie for a transistor that has = 0.98 and Ib = 100μA. | Understand | CAEE018.14 |
| 12 | Explain Input and output characteristics. Derive $\alpha = \beta / \beta+1$.Draw the circuit of CE configuration of transistor. | Understand | CAEE018.14 |
| 13 | Determine the collector current and emitter current for a transistor with $\alpha$ = 0.98 and $I_{CBO}$= 640 μA when the base current is 25Ma. | Understand | CAEE018.14 |
| 14 | Calculate the values of $I_C$ and $I_E$ for a transistor with $\alpha_{dc}$ = 0.99 and $I_{CBO}$ =2.5μA, if $I_B$ is measured as 25 μA. | Understand | CAEE018.14 |
| 15 | If the base current in a transistor is 40μA when the emitter current is 3.5 mA, what are the values of $\alpha_{dc}$ and $\beta_{dc}$? Also determine the collector current. | Understand | CAEE018.14 |

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