INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad-500043

MECHANICAL ENGINEERING

TUTORIAL QUESTION BANK

Course Title	**BASIC ELECTRICAL AND ELECTRONICS ENGINEERING**				
Course Code	AEEB04				
Programme	B.Tech				
Semester	II	ME			
	III	AE			
Course Type	Foundation				
Regulation	**IARE - R18**				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	3	1	4	3	1.5
Chief Coordinator	Ms. B. Manogna, Assistant Professor				
Course Faculty	Ms. B. Manogna, Assistant Professor Ms. B. Navothna, Assistant Professor				

COURSE OBJECTIVES:

The course should enable the students to:	
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 OUTCOMES (COs):

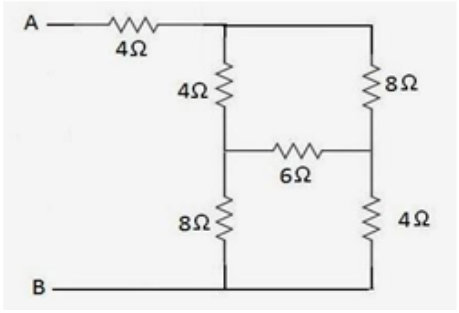
CO 1	Understand the basic concepts of electricity, applications of Kirchhoff laws and source transformation technique to complex circuits. Basic principles of indicating instruments.
CO 2	Explore to the working principle of dc machine, various types and determine the torque equation of dc motor, EMF equation of dc generator purpose of three-point starter.
CO 3	Summarize various alternating quantities and explain working principle of induction motor, alternators and transformers.
CO 4	Discuss the basic theory of semi-conductor diode, rectifier, zener diode and their characteristics.
CO 5	Explain the concept of transistor in various configurations and give its applications.

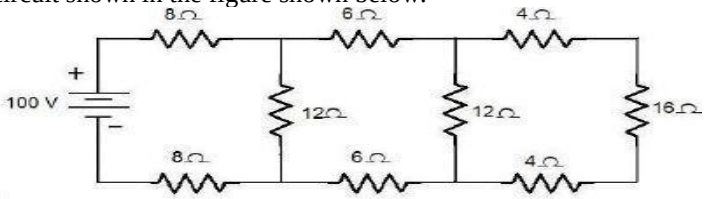
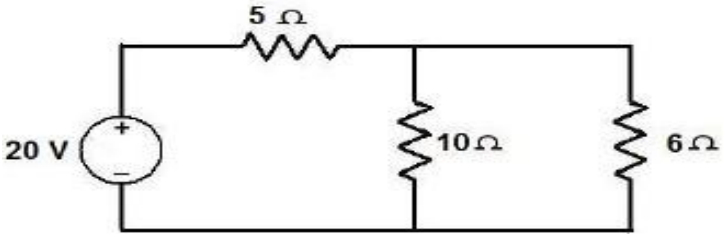
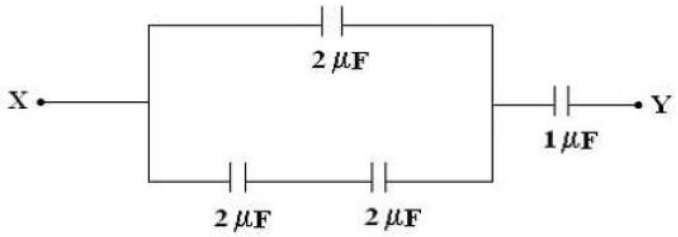
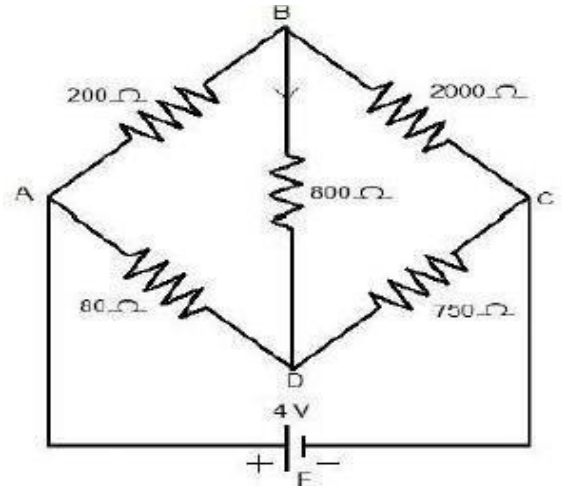
COURSE LEARNING OUTCOMES (CLOs):

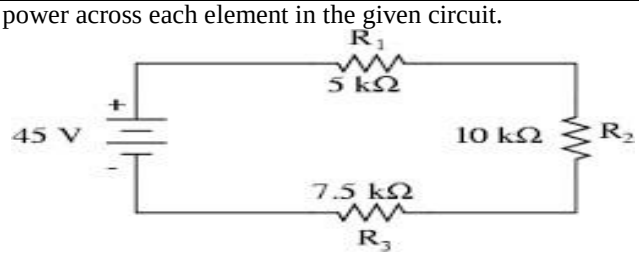
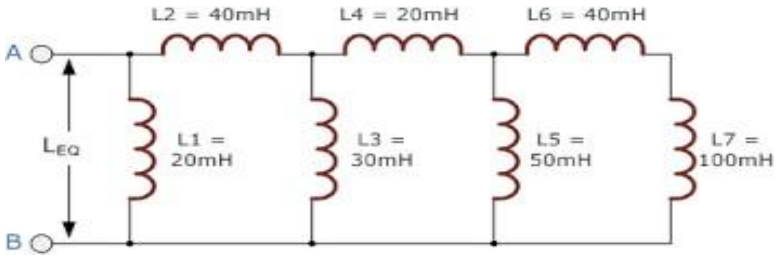
AEEB04.01	Analyze the circuits using Kirchhoff's current and Kirchhoff's voltage law.
AEEB04.02	Use of series-parallel concepts for simplifying circuits.
AEEB04.03	Use star delta transformation for simplifying complex circuits.
AEEB04.04	Generalize operation and principle of measuring instruments.
AEEB04.05	Demonstrate the working principle of DC motor, DC generator.
AEEB04.06	Describe the construction of DC motor and DC generator.
AEEB04.07	Classify the types of DC motor and generator with characteristics and voltage, current and power equations.
AEEB04.08	Derive the EMF equation of DC generator, and various problems on EMF equation.
AEEB04.09	Torque equation of DC motor and understand the purpose of three point starter.
AEEB04.10	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.
AEEB04.11	Discuss the principle of operation of induction motor.
AEEB04.12	Explain the construction and characteristics of alternator.
AEEB04.13	Explain the construction and characteristics of 3-phase induction motor.
AEEB04.14	Explain the principle and construction of Transformer.
AEEB04.15	Understand the working of semi-conductor diode and its V-I characteristics.
AEEB04.16	Discuss the operation of half wave, full wave and bridge rectifiers.
AEEB04.17	Summarize various alternating quantities of half wave, full wave and bridge rectifiers.
AEEB04.18	Apply the concept of diodes in converting AC to DC rectification process.
AEEB04.19	Compare the operation of half wave, full wave and bridge rectifiers.
AEEB04.20	Distinguish the different configurations of transistor.
AEEB04.21	Differentiate the operation of Diodes and transistors.
AEEB04.22	Understand the concept of biasing and load line of transistor.

TUTORIAL QUESTION BANK

MODULE- I				
PROBABILITY AND RANDOM VARIABLES				
Part - A (Short Answer Questions)				
S No	**QUESTIONS**	**Blooms Taxonomy Level**	**Course Outcomes**	**Course Learning Outcomes (CLOs)**
1	State and explain the potential difference.	Remember	CO 1	AEEB04.01
2	Define current.	Remember	CO 1	AEEB04.01
3	Define resistance.	Remember	CO 1	AEEB04.01
4	Give the expression for voltage in terms of W and Q.	Understand	CO 1	AEEB04.01
5	Give the charge of an electron.	Understand	CO 1	AEEB04.01
6	State OHM's law.	Remember	CO 1	AEEB04.01
7	State Kirchhoff's current and Kirchhoff's voltage laws.	Remember	CO 1	AEEB04.01
8	Define the power and energy.	Remember	CO 1	AEEB04.01
9	Describe the active elements.	Remember	CO 1	AEEB04.01
10	Describe passive elements.	Remember	CO 1	AEEB04.01
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	CO 1	AEEB04.02
12	If the charge developed between two plates is 2C and capacitance is 4.5 F, calculate the voltage across the plates.	Understand	CO 1	AEEB04.02
13	If three capacitors are connected in series which are 2F, 3.2F and 6F calculate equivalent capacitance.	Understand	CO 1	AEEB04.02
14	If the three inductors are in parallel with 20mH, 25mH and 50mH, calculate the equivalent inductance.	Understand	CO 1	AEEB04.02
15	Define the inductance.	Remember	CO 1	AEEB04.01
16	Define the capacitance.	Remember	CO 1	AEEB04.01
17	Draw the symbols of different controlled sources.	Remember	CO 1	AEEB04.01
18	Describe measuring instrument.	Understand	CO 1	AEEB04.04
19	Write different types of torques in measuring instruments.	Understand	CO 1	AEEB04.04
20	Define controlling torque.	Remember	CO 1	AEEB04.04
21	Write short notes on spring control mechanism.	Remember	CO 1	AEEB04.04
22	Classify the types of measuring instruments.	Understand	CO 1	AEEB04.04
23	Define controlling torque.	Remember	CO 1	AEEB04.04
24	Define damping torque.	Remember	CO 1	AEEB04.04
Part - B (Long Answer Questions)				
1	Write short notes on voltage-current relations in RLC parameters.	Remember	CO 1	AEEB04.01
2	Explain the Kirchhoff's laws with example and neat diagrams.	Understand	CO 1	AEEB04.01
3	Classify types of elements and explain in detail.	Understand	CO 1	AEEB04.01
4	Distinguish between ideal and practical energy sources.	Understand	CO 1	AEEB04.01
5	State Ohm's law and give its applicability to electrical network. Explain convention current direction and voltage across an element.	Remember	CO 1	AEEB04.01
6	Write the conventions to study any electrical circuit.	Remember	CO 1	AEEB04.01
7	Define the terms voltage, current, power, energy, node and degree of the node.	Remember	CO 1	AEEB04.01
8	State voltage and current division rules and explain with neat example.	Remember	CO 1	AEEB04.01
9	Derive the V-I relationship, power and energy stored in inductor.	Understand	CO 1	AEEB04.01
10	Derive the V-I relationship, power and energy stored in capacitor.	Understand	CO 1	AEEB04.01
11	Derive the equivalent resistance equations when they are connected in series and parallel.	Understand	CO 1	AEEB04.02
12	Derive the equivalent inductance and capacitance equations when they are connected in series and parallel.	Understand	CO 1	AEEB04.02

<table>
<tr><td>13</td><td>Derive the expressions for equivalent resistances while transforming from star to delta and delta to star.</td><td>Understand</td><td>CO 1</td><td>AEEB04.03</td></tr>
<tr><td>14</td><td>Describe eddy current damping in measuring instruments.</td><td>Remember</td><td>CO 1</td><td>AEEB04.04</td></tr>
<tr><td>15</td><td>Explain gravity control in measuring instruments.</td><td>Understand</td><td>CO 1</td><td>AEEB04.04</td></tr>
<tr><td>16</td><td>Explain spring control in measuring instruments.</td><td>Understand</td><td>CO 1</td><td>AEEB04.04</td></tr>
<tr><td>17</td><td>Discuss different types of torques produced in indicating instruments.</td><td>Understand</td><td>CO 1</td><td>AEEB04.04</td></tr>
<tr><td>18</td><td>Describe working principle of moving iron repulsion type instrument.</td><td>Remember</td><td>CO 1</td><td>AEEB04.04</td></tr>
<tr><td>19</td><td>Describe air friction damping in measuring instruments.</td><td>Remember</td><td>CO 1</td><td>AEEB04.04</td></tr>
<tr><td>20</td><td>Explain working principle of permanent magnet moving coil instrument with neat diagram.</td><td>Understand</td><td>CO 1</td><td>AEEB04.04</td></tr>
<tr><td>21</td><td>Describe working principle of moving iron attraction type instrument with neat diagram.</td><td>Remember</td><td>C0 1</td><td>AEEB04.04</td></tr>
<tr><td colspan="5">Part - C (Problem Solving and Critical Thinking Questions)</td></tr>
<tr><td>1</td><td>Calculate the equivalent resistance and source current for the given data.
<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>AEEB04.01</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>AEEB04.01</td></tr>
<tr><td>3</td><td>Use network reduction technique and calculate current response in each element.
<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>AEEB04.01</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>AEEB04.01</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>CO 1</td><td>AEEB04.01</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>AEEB04.01</td></tr>
<tr><td>7</td><td>Calculate the equivalent resistance between A and B terminals using star delta transformation.

</td><td>Understand</td><td>CO 1</td><td>AEEB04.03</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>
</table></td><td>Understand</td><td>CO 1</td><td>AEEB04.1</td></tr>
</table>

		4 ohms	a	b			
		5 ohms	b	0			
		2 ohms	b	c			
		3 ohms	c	0			
9	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. 	Understand	CO 1	AEEB04.02
10	Calculate the power consumed by each resistor. 	Understand	CO 1	AEEB04.02
11	Calculate the equivalent capacitance of the combination shown figure below across X and Y. 	Understand	CO 1	AEEB04.02
12	A capacitor having capacitance of 5μF is charged to a voltage of 10V. Calculate the stored energy in joules.	Remember	CO 1	AEEB04.01
13	Determine the current through 800 ohm resistor in the network shown in figure. 	Understand	CO 1	AEEB04.02

14	Calculate power across each element in the given circuit. 	Understand	CO 1	AEEB04.02
15	Calculate equivalent inductance in the given circuit. 	Understand	CO 1	AEEB04.02
	MODULE-II			
	DC MACHINES			
	Part – A (Short Answer Questions)			
1	State Fleming's Right Hand Rule.	Remember	CO 2	AEEB04.05
2	Describe the basic principle of a DC generator.	Remember	CO 2	AEEB04.05
3	List the basic parts of a DC generator.	Remember	CO 2	AEEB04.06
4	Give expression for EMF equation of DC Generator	Remember	CO 2	AEEB04.07
5	Classify the types of DC generators.	Remember	CO 2	AEEB04.07
6	Draw circuit diagram for Series motor and give voltage and current equations.	Remember	CO 2	AEEB04.07
7	Explain back EMF in DC motor.	Understand	CO 2	AEEB04.08
8	Draw the circuit diagram of a DC series motor.	Remember	CO 2	AEEB04.09
9	List the applications of DC motors.	Understand	CO 2	AEEB04.06
10	Describe function of commutator.	Understand	CO 2	AEEB04.05
11	Draw the open circuit characteristics of DC separately excited generator.	Remember	CO 2	AEEB04.07
12	Define residual EMF in a generator.	Understand	CO 2	AEEB04.05
13	State Faraday's laws of electromagnetic induction.	Remember	CO 2	AEEB04.05
14	State Fleming's left hand rule.	Remember	CO 2	AEEB04.05
15	Write the voltage, armature current and power equation of DC shunt motor.	Remember	CO 2	AEEB04.08
16	Explain functions of yoke.	Understand	CO 2	AEEB04.06
17	Explain the function of brush in DC machines.	Understand	CO 2	AEEB04.06
18	Draw the circuit diagram of a DC shunt motor.	Remember	CO 2	AEEB04.06
19	Draw the circuit diagram of a DC shunt motor.	Remember	CO 2	AEEB04.06
20	Give expression for torque equation of DC motor.	Remember	CO 2	AEEB04.06
	Part - B (Long Answer Questions)			
1	Describe the construction of DC machine with neat diagram.	Remember	CO 2	AEEB04.06
2	Discuss the principle of operation of DC generator.	Understand	CO 2	AEEB04.05
3	Derive the equation for induced EMF of a DC machine.	Understand	CO 2	AEEB04.08
4	Explain the principle of operation of DC Motor.	Understand	CO 2	AEEB04.07
5	Give the classification of DC generator and explain with neat diagrams.	Remember	CO 2	AEEB04.07
6	Derive the torque equation of DC motor.	Understand	CO 2	AEEB04.08
7	Discuss different types of characteristics of different types of generators.	Understand	CO 2	AEEB04.08
8	Explain three point starter for DC Shunt motor.	Understand	CO 2	AEEB04.09
9	Explain the purpose and working three point starter with a neat sketch.	Understand	CO 2	AEEB04.09
10	Differentiate between self-excited and separately excited DC machines.	Understand	CO 2	AEEB04.07
11	Discuss Different types of characteristics of DC motors.	Understand	CO 2	AEEB04.06
12	Give the classification of DC generator, and voltage current and power equation with neat diagrams.	Remember	CO 2	AEEB04.07
13	Explain the windings used in DC machines.	Remember	CO 2	AEEB04.06

14	Give the classification of DC generator and derive expression for EMF Equation of DC generator.	Remember	CO 2	AEEB04.07
15	Explain the open circuit characteristics of DC series generator.	Understand	CO 2	AEEB04.09
16	Explain the open circuit characteristics of DC compound generator.	Understand	CO 2	AEEB04.09
17	Explain the open circuit characteristics of DC shunt generator.	Understand	CO 2	AEEB04.09
18	Explain single loop generator with commutator.	Remember	CO 2	AEEB04.06
19	Give the classification of DC motors and explain with neat diagrams.	Understand	CO 2	AEEB04.07
20	Explain lap winding in DC machines with neat sketch.	Understand	CO 2	AEEB04.07
Part - C (Problem Solving and Critical Thinking 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	CO 2	AEEB04.08
2	A 6 pole lap wound DC generator has 600 conductors on its armature flux per pole is 0.02 Wb. Calculate 1. The speed at which the generator must be run to generate 300V 2. What would be the speed if the generated were wave wound.	Understand	CO 2	AEEB04.08
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	CO 2	AEEB04.08
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	CO 2	AEEB04.08
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	CO 2	AEEB04.08
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	CO 2	AEEB04.08
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	CO 2	AEEB04.08
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	CO 2	AEEB04.08
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	CO 2	AEEB04.09
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	CO 2	AEEB04.09
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	CO 2	AEEB04.09
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	CO 2	AEEB04.09
13	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	CO 2	AEEB04.09
14	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	CO 2	AEEB04.09
15	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	CO 2	AEEB04.09
16	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	CO 2	AEEB04.09

	MODULE -III			
	ALTERNATING QUANTITIES AND AC MACHINES			
	Part - A (Short Answer Questions)			
1	Mention the difference between core and shell type transformers.	Understand	CO 3	AEEB04.14
2	State working principle of transformer.	Remember	CO 3	AEEB04.14
3	Give the EMF equation of a transformer and define each term.	Remember	CO 3	AEEB04.14
4	Define voltage regulation of a transformer.	Understand	CO 3	AEEB04.14
5	Classify various transformers based on voltages.	Understand	CO 3	AEEB04.14
6	Classify various transformers based on construction.	Understand	CO 3	AEEB04.14
7	Define transformation ratio.	Remember	CO 3	AEEB04.10
8	Define form factor of a sinusoidal signal .	Remember	CO 3	AEEB04.10
9	Define average value of a sinusoidal signal.	Remember	CO 3	AEEB04.10
10	Define RMS Value of a sinusoidal signal.	Remember	CO 3	AEEB04.10
11	Define peak factor of a sinusoidal signal.	Remember	CO 3	AEEB04.10
12	Describe the functions of transformer	Understand	CO 3	AEEB04.14
13	Define efficiency of a transformer.	Remember	CO 3	AEEB04.14
14	Define various alternating quantities.	Remember	CO 3	AEEB04.10
15	Give expression for RMS and Average value.	Remember	CO 3	AEEB04.10
16	Give expression for Form factor and peak factor.	Remember	CO 3	AEEB04.10
17	Classify induction motors based on construction.	Understand	CO 3	AEEB04.13
18	Define voltage regulation of an alternator.	Understand	CO 3	AEEB04.12
19	Classify the losses of transformer.	Understand	CO 3	AEEB04.14
20	Write the expression for eddy current losses and define each term.	Remember	CO 3	AEEB04.14
21	Write the expression for hysteresis losses and define each term.	Remember	CO 3	AEEB04.14
22	Write the EMF equation of alternator.	Understand	CO 3	AEEB04.12
	Part – B (Long Answer Questions)			
1	Describe the construction details of single phase transformer.	Understand	CO 3	AEEB04.14
2	Explain the principle of operation of transformer.	Understand	CO 3	AEEB04.14
3	Derive the EMF equation of a transformer.	Remember	CO 3	AEEB04.14
4	Discuss about different types of losses in transformer.	Understand	CO 3	AEEB04.14
5	Describe the method to perform OC and SC test on a transformer.	Understand	CO 3	AEEB04.14
6	Derive maximum torque condition under running condition.	Understand	CO 3	AEEB04.13
7	Draw torque slip characteristics of three phase induction motor.	Understand	CO 3	AEEB04.11
8	List the types of Alternator based on rotor construction.	Understand	CO 3	AEEB04.12
9	Derive average, RMS, form and peak factors of a sinusoidal signal.	Understand	CO 3	AEEB04.10
10	Explain concept of three phase alternating quantity.	Understand	CO 3	AEEB04.10
11	Discuss the principle and operation of three phase induction motor.	Understand	CO 3	AEEB04.11
12	Discuss about Different types of Induction motors depends upon the rotor construction.	Understand	CO 3	AEEB04.13
13	Derive maximum torque condition under running and standstill condition of induction motor.	Understand	CO 3	AEEB04.13
14	Describe the construction of alternator depends upon rotor construction.	Understand	CO 3	AEEB04.12
15	Discuss synchronous impedance method to find regulation of an alternator.	Understand	CO 3	AEEB04.12
16	Explain briefly about various types of alternator.	Understand	CO 3	AEEB04.12
17	Explain construction of salient pole rotor.	Understand	CO 3	AEEB04.12
18	Explain construction of cylindrical pole rotor and give its advantages.			
19	Draw the torque slip characteristics of induction motor.	Understand	CO 3	AEEB04.13
20	Explain the working principle of alternator.	Remember	CO 3	AEEB04.12
	Part – C (Problem Solving and Critical Thinking)			
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	CO 3	AEEB04.14
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	CO 3	AEEB04.14

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	CO 3	AEEB04.14
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	CO 3	AEEB04.14
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	CO 3	AEEB04.14
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	CO 3	AEEB04.14
7	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	CO 3	AEEB04.14
8	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	CO 3	AEEB04.14
9	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	CO 3	AEEB04.14
10	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	CO 3	AEEB04.12
11	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	CO 3	AEEB04.12
12	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	CO 3	AEEB04.13
13	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	CO 3	AEEB04.13
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	CO 3	AEEB04.13
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	CO 3	AEEB04.13
	MODULE -IV			
	SEMICONDUCTOR DIODE AND APPLICATIONS			
	Part – A (Short Answer Questions)			
1	Define terms conductor, insulators and semiconductors.	Understand	CO 4	AEEB04.15
2	Define semiconductor.			
3	Explain forward bias of diode.	Remember	CO 4	AEEB04.15
4	Explain reverse bias of diode.	Remember	CO 4	AEEB04.15
5	Write the Applications of diode.	Understand	CO 4	AEEB04.15
6	Draw the V-I characteristics of diode.	Understand	CO 4	AEEB04.15
7	Differentiate intrinsic and extrinsic semiconductors.	Understand	CO 4	AEEB04.15
8	Explain avalanche breakdown.	Understand	CO 4	AEEB04.15
9	Draw the characteristics of zener diode.	Understand	CO 4	AEEB04.15
10	Discuss the importance of cut in voltage.	Understand	CO 4	AEEB04.15
11	Define transformer utility factor.	Understand	CO 4	AEEB04.16
12	Explain majority and minority carriers in a semiconductor.	Understand	CO 4	AEEB04.17

13	Define efficiency.	Remember	CO 4	AEEB04.19
14	Define form factor.	Understand	CO 4	AEEB04.15
15	Define peak inverse voltage.	Understand	CO 4	AEEB04.15
16	Define ripple factor.	Understand	CO 4	AEEB04.15
17	Write the equation of diode current.	Understand	CO 4	AEEB04.15
18	Define rectifier.	Understand	CO 4	AEEB04.15
19	Difference between diode and zener diode.	Understand	CO 4	AEEB04.15
20	Define regulator.	Understand	CO 4	AEEB04.15
	Part – B (Long Answer Questions)			
1	Explain the theory of PN junction in semiconductors and explain how it acts as diode.	Understand	CO 4	AEEB04.15
2	Explain the operation of PN junction diode in forward bias and reverse bias.	Understand	CO 4	AEEB04.15
3	Explain how zener diode is used as voltage regulator.	Understand	CO 4	AEEB04.15
4	Describe the diode current equation.	Remember	CO 4	AEEB04.15
5	Analyze the effect of temperature on the volt –ampere characteristics of a diode.	Understand	CO 4	AEEB04.16
6	Define rectifier. Describe average and RMS values for output voltage in half wave rectifier.	Understand	CO 4	AEEB04.17
7	Describe average and RMS values for output voltage in centre tapped full wave rectifier.	Understand	CO 4	AEEB04.17
8	Describe average, RMS values and form factor for output voltage in centre tapped full wave rectifier.	Understand	CO 4	AEEB04.17
9	Describe average and RMS values and form factor for output voltage in half wave rectifier.	Understand	CO 4	AEEB04.17
10	Explain how diode acts as switch.	Understand	CO 4	AEEB04.15
11	Explain zener and avalanche breakdown mechanisms in detail.	Understand	CO 4	AEEB04.15
12	Explain the relative merits and demerits of all the rectifiers.	Understand	CO 4	AEEB04.19
13	Describe potential energy barrier of the p-n junction? How does it arise and what is its order of magnitude.	Understand	CO 4	AEEB04.15
14	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	CO 4	AEEB04.15
15	Explain working of zener diode as voltage regulator.	Understand	CO 4	AEEB04.15
16	Explain the V-I characteristics of Zener diode and Analyze between avalanche and zener break downs.	Understand	CO 4	AEEB04.15
17	Explain in detail, the variation of following semiconductor parameters with temperature, i) Energy gap ii) Conductivity.	Understand	CO 4	AEEB04.15
18	List out the merits and demerits of Bridge type Full Wave rectifiers over centre tapped type Full Wave rectifiers.	Understand	CO 4	AEEB04.19
19	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	CO 4	AEEB04.16
20	Sketch the V-I characteristics of p-n junction diode for forward bias voltages.	Understand	CO 4	AEEB04.15
	Part – C (Problem Solving and Critical Thinking)			
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	CO 4	AEEB04.17
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	CO 4	AEEB04.17
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	CO 4	AEEB04.15
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	CO 4	AEEB04.17
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	CO 4	AEEB04.17

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	CO 4	AEEB04.17
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	CO 4	AEEB04.17
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	CO 4	AEEB04.15
9	Calculate the value of D.C. resistance and A.C resistance of a Germanium junction diode at 25^0C with reverse saturation current, I_o= 25μA and at an applied voltage of 0.2V across the diode.	Understand	CO 4	AEEB04.15
10	The reverse saturation current of a silicon p –n junction diode at an operating temperature of 27^0C 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	CO 4	AEEB04.15
11	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	CO 4	AEEB04.15
12	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	CO 4	AEEB04.17
13	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	CO 4	AEEB04.17
14	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	CO 4	AEEB04.15
	MODULE -V			
	BIPOLAR JUNCTION TRANSISTOR AND APPLICATIONS			
	Part - A (Short Answer Questions)			
1	Define transistor.	Understand	CO 5	AEEB04.20
2	Describe the operating point of transistor.	Understand	CO 5	AEEB04.20
3	Draw the symbols of NPN and PNP transistor.	Remember	CO 5	AEEB04.20
4	Explain the operation of BJT and its types.	Remember	CO 5	AEEB04.21
5	Explain the breakdown in transistor.	Understand	CO 5	AEEB04.20
6	Define transistor current.	Understand	CO 5	AEEB04.20
7	Describe how a transistor acts as a switch.	Understand	CO 5	AEEB04.20
8	Define saturation region.	Remember	CO 5	AEEB04.20
9	Define active region.	Remember	CO 5	AEEB04.20
10	Write the relation between I_C, β, I_B and I_{CBO} in a BJT.	Understand	CO 5	AEEB04.20
11	Define amplifier.	Understand	CO 5	AEEB04.20
12	Define Biasing.	Understand	CO 5	AEEB04.20
13	Define current amplification factor.	Understand	CO 5	AEEB04.20
14	Explain about the various regions in a transistor.	Understand	CO 5	AEEB04.20
15	Draw and explain the dc load line.	Understand	CO 5	AEEB04.22
16	Discuss why biasing is necessary in BJT amplifiers.	Understand	CO 5	AEEB04.22
17	Define cut-off region in transistor characteristics.	Understand	CO 5	AEEB04.21
18	Write a short note on transistor construction.	Understand	CO 5	AEEB04.20
19	Design a circuit and explain the working of a transistor as a switch.	Understand	CO 5	AEEB04.21
20	Explain the concept of DC load line with the help of neat diagram.	Remember	CO 5	AEEB04.22
	Part - B (Long Answer Questions)			
1	Explain the operation of NPN and PNP transistor.	Remember	CO 5	AEEB04.20
2	Illustrate with a diagram, how the BJT transistor acts as an amplifier.	Understand	CO 5	AEEB04.21
3	Explain the working of a transistor as an amplifier.	Remember	CO 5	AEEB04.21
4	Explain the term α and β current gains and their relationship for N-P-N transistor.	Remember	CO 5	AEEB04.20

5	Draw the input and output characteristics of a transistor in common emitter configurations.	Understand	CO 5	AEEB04.20
6	Explain the constructional details of Bipolar Junction Transistor.	Understand	CO 5	AEEB04.20
7	Describe the significance of the terms, α and β. Establish a relation between them.	Understand	CO 5	AEEB04.21
8	Derive the relation among α, β and γ in CE configuration.	Understand	CO 5	AEEB04.21
9	Determine the significance of operating point, DC and AC load lines to ensure active region operation of a BJT in CE amplifier.	Understand	CO 5	AEEB04.22
10	Explain the concept of biasing and dc load line.	Understand	CO 5	AEEB04.22
11	Explain the concept of biasing and ac load line with neat sketch.	Understand	CO 5	AEEB04.22
12	Explain the concept of ac and dc load line with the help of neat diagram.	Remember	CO 5	AEEB04.22
13	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	CO 5	AEEB04.20
14	Give the relationship between α, β and γ of a transistor in CC configuration.	Understand	CO 5	AEEB04.21
15	Give the relationship between α, β and γ of a transistor in CB configuration.	Understand	CO 5	AEEB04.21
16	Give the relationship between α, β and γ of a transistor in CE configuration.	Understand	CO 5	AEEB04.21
17	Design a circuit and explain the working of a transistor as a switch.	Understand	CO 5	AEEB04.21
18	Explain the input and output characteristics of a transistor in CB configuration.	Remember	CO 5	AEEB04.20
19	Explain the input and output characteristics of a transistor in CE configuration.	Remember	CO 5	AEEB04.20
20	Explain the input and output characteristics of a transistor in CC configuration.	Remember	CO 5	AEEB04.20
	Part – C (Problem Solving and Critical Thinking)			
1	Calculate the values of I_C and I_E for a transistor with α_{dc} = 0.99 and I_{CBO} =5μA, if I_B is measured as 20μA?	Understand	CO 5	AEEB04.20
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	CO 5	AEEB04.20
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	CO 5	AEEB04.20
4	For an NPN transistor with α_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	CO 5	AEEB04.22
5	If the base current in a transistor is 20μA when the emitter current is 6.4mA, what are the values of α_{dc} and β_{dc}? Also determine the collector current.	Understand	CO 5	AEEB04.20
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	CO 5	AEEB04.20
7	A) Calculate α_{dc}, For each of the following values of β_{dc}=50 and 190. B) Calculate β_{dc} for each of the following values of α_{dc}=0.995 and 0.9765.	Understand	CO 5	AEEB04.20
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	CO 5	AEEB04.20
9	In a Common Emitter transistor circuit if β = 100 and IB = 50μA, compute the values of α, I_E and I_C.	Understand	CO 5	AEEB04.20
10	Find the value of β if α = 0.9.(where α and β are current amplification factor in Common Emitter configuration.	Understand	CO 5	AEEB04.20
11	Derive the relationship between α and β. Calculate the value of Ic, Ie for a transistor that has = 0.98 and Ib = 100μA.	Understand	CO 5	AEEB04.20
12	Explain Input and output characteristics. Derive α = β / β+1.Draw the circuit of CE configuration of transistor.	Understand	CO 5	AEEB04.20
13	Determine the collector current and emitter current for a transistor with α = 0.98 and I_{CBO}= 640 μA when the base current is 25Ma.	Understand	CO 5	AEEB04.20
14	Calculate the values of I_C and I_E for a transistor with α_{dc} = 0.99 and I_{CBO} =2.5μA, if I_B is measured as 25 μA.	Understand	CO 5	AEEB04.21
15	If the base current in a transistor is 40μA when the emitter current is 3.5 mA, what are the values of α_{dc} and β_{dc}? Also determine the collector current.	Understand	CO 5	AEEB04.21

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