INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad-500043

MECHANICAL ENGINEERING
TUTORIAL QUESTION BANK

Course Name	:	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING
Course Code	:	AEE018
Class	:	II B. Tech I Semester (III Semester)
Branch	:	MECHANICAL ENGINEERING
Year	:	2018 – 2019
Course Coordinator	:	Mr. N Shivaprasad, Assistant professor, EEE
Course Faculty	:	Dr. G Hemakumar Reddy, Associate professor, EEE Mr. N Shivaprasad, Assistant professor, EEE

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

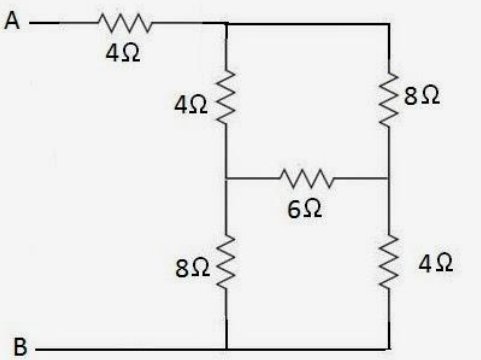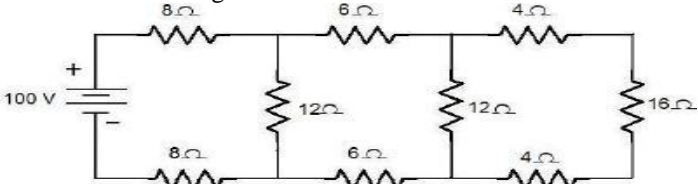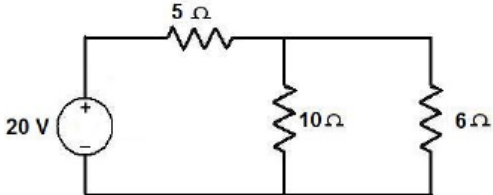| CAEE018.01	Analyze the circuits using Kirchhoff's current law and Kirchhoff's voltage law.
CAEE018.02	Use star delta transformation for simplifying complex circuits.
CAEE018.03	Generalize operation and principle of measuring instruments.
CAEE018.04	Demonstrate the working principle of DC motor, DC 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.

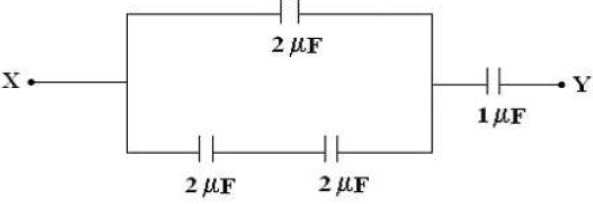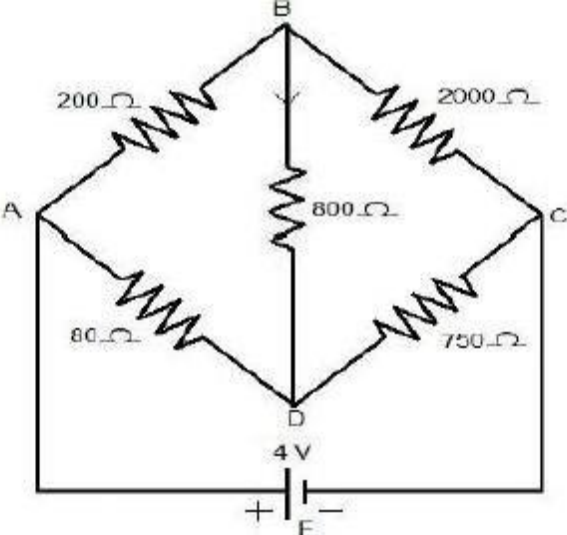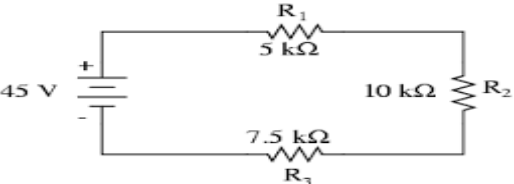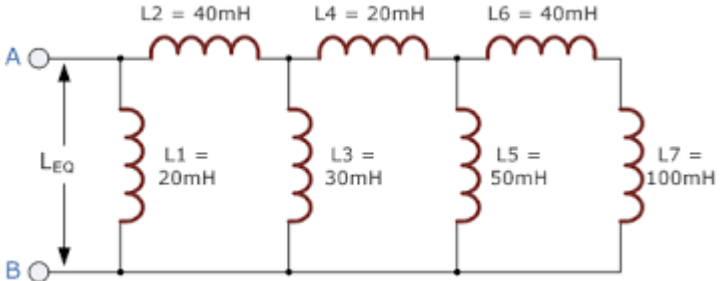| CAEE018.11 | Compare the operation of half wave, full wave and bridge rectifiers. |
CAEE018.12	Differentiate the operation and biasing of semiconductor devices like diodes and transistor.
CAEE018.13	Apply the concept of diodes in converting AC to DC.
CAEE018.14	Distinguish the different configurations 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

	Part - B (Long Answer Questions)		
1	Write short notes on voltage-current relations in RLC parameters.	Remember	CAEE018.01
3	Explain the Kirchhoff's laws with example and neat diagrams.	Understand	CAEE018.01
4	Classify types of elements and explain in detail.	Understand	CAEE018.01
5	Distinguish between ideal and practical energy sources.	Understand	CAEE018.01
6	State Ohm's law and give its applicability to electrical network. Explain convention current direction and voltage across an element.	Remember	CAEE018.01
7	Write the conventions to study any electrical circuit.	Remember	CAEE018.01
8	Define the terms voltage, current, power, energy, node and degree of the node.	Remember	CAEE018.01
9	State voltage and current division rules and explain with neat example.	Remember	CAEE018.01
10	Derive the V-I relationship, power and energy stored in inductor.	Understand	CAEE018.01
11	Derive the V-I relationship, power and energy stored in capacitor.	Understand	CAEE018.01
12	Derive the equivalent resistance equations when they are connected in series and parallel.	Understand	CAEE018.01
13	Derive the equivalent inductance and capacitance equations when they are connected in series and parallel.	Understand	CAEE018.01
14	Derive the expressions for equivalent resistances while transforming from star to delta and delta to star.	Understand	CAEE018.02
16	Describe eddy current damping in measuring instruments.	Remember	CAEE018.03
17	Explain gravity control in measuring instruments.	Understand	CAEE018.03
18	Explain spring control in measuring instruments.	Understand	CAEE018.03
19	Discuss different types of torques produced in indicating instruments.	Understand	CAEE018.03
20	Describe working principle of moving iron repulsion type instrument.	Remember	CAEE018.03
21	Describe air friction damping in measuring instruments.	Remember	CAEE018.03
22	Explain working principle of permanent magnet moving coil instrument with neat diagram.	Understand	CAEE018.03
23	Describe working principle of moving iron attraction type instrument with neat diagram.	Remember	CAEE018.03
	Part - C (Analytical Questions)		

Part - C (Analytical Questions)

1	Calculate the equivalent resistance and source current for the given data.			Understand	CAEE018.01
	element	From node	To node		
	30 V source	a	0		
	4 ohms	a	b		
	5 ohms	b	0		
	2 ohms	b	c		
	3 ohms	c	0		
	5 ohms	c	d		
	6 ohms	d	0		
2	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.			Understand	CAEE018.01
3	Use network reduction technique and calculate current response in each element.			Understand	CAEE018.01
	element	From node	To node		
	25 V source	a	0		
	6 ohms	a	b		
	8 ohms	b	0		
	2 ohms	b	c		
	3 ohms	b	c		
	5 ohms	c	0		

4	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.	Understand	CAEE018.01
5	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.	Understand	CAEE018.01
6	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.	Understand	CAEE018.01
7	Calculate the equivalent resistance between A and B terminals using star delta transformation. 	Understand	CAEE018.02
8	Calculate equivalent resistance, source current, voltage drop and power dissipated in each resistor. | element	From node	To node
---	---	---
20 V source	a	0
4 ohms	a	b
5 ohms	b	0
2 ohms	b	c
3 ohms	c	0		Understand	CAEE018.01
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	CAEE018.01
10	Calculate the power consumed by each resistor. 	Understand	CAEE018.01

	Calculate the equivalent capacitance of the combination shown figure below across X and Y.	Understand	
11			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. 	Understand	CAEE018.02
14	Calculate power across each element in the given circuit. 	Understand	CAEE018.01
15	Calculate equivalent inductance in the given circuit. 	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

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
	    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	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	

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

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

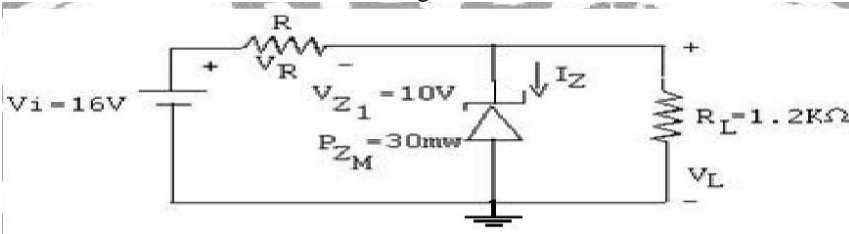|			
6	A 440/110 v transformer has a primary resistance of 0.03 ohms and secondary resistance of 0.02 ohms if iron losses at normal input is 150 watts determine the secondary current at which maximum efficiency will occur and the value of this maximum efficiency at a unity power factor load.	Understand	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

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 $I_0=10\mu A$ $V_f = 0.8V$ at $T=300^0K$ 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

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 25^0C 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 27^0C 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	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)			
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

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 $I_{CBO} = 5\mu A$, if I_B is measured as $20\mu A$?	Understand	CAEE018.14
2	Determine the collector current and emitter current for a transistor with $\alpha = 0.99$ and $I_{CBO} = 490\mu A$ when the base current is $19\mu A$	Understand	CAEE018.13
3	The reverse leakage current of the transistor when connected in CB configuration is $0.2\mu A$ while it is $18\mu A$ 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 $\alpha_N = 0.98$, $I_{CO} = 2\mu A$ and $I_{EO} = 1.6\mu A$ connected in Common Emitter Configuration, Determine the minimum base current for which the transistor enters into saturation region. VCC and load resistance are given as 12 V and 4.0 KΩ respectively.	Understand	CAEE018.14
5	If the base current in a transistor is $20\mu A$ when the emitter current is 6.4mA, what are the values of α_{dc} and β_{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

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	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 β = 100 and IB = 50μA, compute the values of α, I_E and I_C.	Understand	CAEE018.14
10	Find the value of β if α = 0.9.(where α and β are current amplification factor in Common Emitter configuration.	Understand	CAEE018.13
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	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 α = 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 α_{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 α_{dc} and β_{dc}? Also determine the collector current.	Understand	CAEE018.14

Prepared By:
Dr. G Hemakumar Reddy, Associate professor, EEE
Mr. N Shiva Prasad, Assistant Professor, EEE   HOD, ME