



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

ELECTRICAL AND ELECTRONICS ENGINEERING

DEFINITIONS AND TERMINOLOGY QUESTION BANK

Course Name	:	POWER ELECTRONICS
Course Code	:	AEE010
Program	:	B. Tech
Semester	:	V
Branch	:	Electrical and Electronics Engineering
Section	:	A & B
Academic Year	:	2019 -2020
Course Faculty	:	Mr. S. Srikanth, Assistant Professor

OBJECTIVES:

The course should enable the students to:	
I	Integrate the revolutionary development in power transmission, distribution and utilization with the advent of semiconductor devices.
II	Demonstrate rectifiers, choppers and various schemes of pulse width modulated inverters.
III	Explain AC voltage converters and cycloconverters.
IV	Outline complete range of power supplies, including switched mode regulators and applications

DEFINITIONS AND TERMINOLOGY QUESTION BANK:

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
UNIT - I						
POWER SEMICONDUCTOR DEVICES AND COMMUTATION CIRCUITS						
1	Define power electronics	The study of controlling the flow of electrical energy with the help of electronic circuits is defined as Power Electronics	Remember	CO1	CLO1	AEE010.01
2	Describe thyristor	Thyristor is a four layered semiconductor rectifier in which the flow of current between two electrodes is triggered by a signal at a third electrode	Understand	CO1	CLO1	AEE010.01
3	Define latching current	Latching current is the minimum anode current required to maintain the thyristor in the on state immediately after a thyristor has been turned on and the gate signal has been removed	Remember	CO1	CLO1	AEE010.01
4	Describe holding current	Holding current is defined as the minimum anode current beyond thyristor turns off. The holding current is associated with turn off process and holding current is always less than the latching current	Understand	CO1	CLO1	AEE010.01

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5	Define Bipolar Junction Transistor	A Bipolar Junction Transistor, or BJT, is a solid state device in which the current flow between two terminals (the collector and the emitter) is controlled by the amount of current that flows through a third terminal (the base)	Remember	CO1	CLO1	AEE010.01
6	Describe natural commutation	Thyristor is turned off naturally without using any external components or circuit or supply is called Natural Commutation. Natural commutation can be observed in AC voltage controllers, phase controlled rectifiers and cycloconverters.	Understand	CO1	CLO2	AEE010.02
7	Describe forced commutation	The process of turning OFF a thyristor or SCR by using external circuits is known as Forced Commutation. The circuit used for this commutation method is known as commutation circuit and the components that are used in the circuitry, are known as commutating components	Understand	CO1	CLO2	AEE010.02
8	Describe snubber circuit	A Snubber circuit is the combination of resistors and capacitors connected in series across the switch like transistor or Thyristor for the protection as well as for improving performance	Understand	CO1	CLO3	AEE010.03
9	Describe rise time	Rise time of SCR is the time taken by the anode current to rise from 10% to 90% of its final value at the same time anode voltage will fall from 90% to 10% of its initial value	Understand	CO1	CLO1	AEE010.01
10	Define load commutation	Commutation of thyristors by induced voltages in load is known as load commutation	Remember	CO1	CLO2	AEE010.02
11	Define derating	Derating is the operation of a device at less than its rated maximum capability in order to prolong its life	Remember	CO1	CLO4	AEE010.04
12	Describe commutation	The turn OFF process of an SCR is called commutation. The term commutation means the transfer of currents from one path to another. So the commutation circuit does this job by reducing the forward current to zero so as to turn OFF the SCR or Thyristor	Understand	CO1	CLO2	AEE010.02
13	Describe the firing angle	Firing angle refers to the phase angle of the ac supply voltage when the GATE current is applied and thyristor turns ON. Lower the firing angle, higher is the power transferred to the load	Understand	CO1	CLO2	AEE010.02
14	Define extinction angle	Extinction angle is one where the thyristor gets switched off in spite of being reverse biased. When SCR is feeding to a inductive load then current lags the load voltage, when voltage becomes -VE but load current does not fall to zero and thyristor keep on conducting. the angle where current fall to zero and thyristor gets switched off is known as extinction angle	Remember	CO1	CLO2	AEE010.02
15	Describe the two transistor analogy	The two transistor analogy is used for PNPN devices, typically SCR. It is like from One side PNP transistor and from the other side NPN transistor. This analogy helps understanding the working of an SCR. When connected back-to-back, these transistor	Understand	CO1	CLO1	AEE010.01

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		analogy helps how current flows continuously once latching is achieved				
UNIT - II SINGLE PHASE AND THREE PHASE CONTROLLED RECTIFIERS						
1	Define Rectifier	Rectifier is the circuit which converts alternating current into direct current. This process is called rectification	Remember	CO2	CLO5	AEE010.05
2	Define delay angle	The delay angle is defined as the angle between the zero crossing of the input voltage and the instant the thyristor is fired	Remember	CO2	CLO5	AEE010.05
3	Define dual converter	Dual Converter is a Circuit made by the combination of two bridges connected back to back provides four quadrant operations	Remember	CO2	CLO6	AEE010.06
4	Define input power factor	In electrical engineering, the power factor of an AC electrical power system is defined as the ratio of the real power absorbed by the load to the apparent power across the load	Remember	CO2	CLO5	AEE010.05
5	Describe forward motoring	When the Motor is rotated in the forward direction the speed of the motor is considered positive. The drives which operate only in one direction,	Understand	CO2	CLO6	AEE010.06
6	Describe non circulating current	In a dual converter without circulating current operating mode, the flow of circulating current is completely inhibited through automatic control of the firing pulses, so that only that converter which carries the load current is in conduction and the other converter is temporarily blocked	Understand	CO2	CLO6	AEE010.06
7	Describe function of freewheeling diode	The main purpose of freewheeling diode is to free wheel the stored energy in inductor by providing a short circuit path. This is necessary else a sudden decay in circuit current will give rise to high voltage across the switch contacts and diode	Understand	CO2	CLO5	AEE010.05
8	Define peak inverse voltage	The peak inverse voltage is either the specified maximum voltage that a rectifier can block or alternatively the maximum voltage that a rectifier needs to block in a given circuit	Remember	CO2	CLO5	AEE010.05
9	Describe form factor	The form factor of an alternating current waveform is the ratio of the root mean square value to the average value It identifies the ratio of the direct current of equal power relative to the given alternating current	Understand	CO2	CLO5	AEE010.05
10	Define average value	Mean or average value of alternating current is that value of steady current which sends the same amount of charge through a circuit in a certain time interval as is sent by an alternating current through the same circuit in the same time interval	Remember	CO2	CLO5	AEE010.05
11	Describe harmonics	The presence of harmonics in electrical systems means that current and voltage are distorted and deviate from sinusoidal waveforms. Harmonic currents are caused by non-linear loads connected to the distribution system	Understand	CO2	CLO5	AEE010.05
12	Describe	The single phase bridge rectifier is a	Understand	CO2	CLO5	AEE010.05

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	single phase bridge rectifier	controlled rectifier in that the applied single phase input voltage is passed directly to the output terminals providing a fixed average DC equivalent value				
13	Define source inductance	Source inductance has a significant impact on the converter performance because its presence alters the output voltage of the converter. As a result, the output voltage reduces as the load current reduces. In addition, the input current and output voltage waveforms change significantly	Remember	CO2	CLO5	AEE010.05
14	Define discontinuous conduction mode	Discontinuous conduction mode, inductor current is not persistent throughout the complete cycle and reaches zero level earlier even before the end of the period. Discontinuous conduction mode inductance is less than the minimum value of the inductance for the continuous conduction mode	Remember	CO2	CLO5	AEE010.05
15	Describe three phase bridge rectifier	The three phase bridge rectifier is a controlled rectifier in that the applied three phase input voltage is passed directly to the output terminals providing a fixed average DC equivalent value	Understand	CO2	CLO5	AEE010.05
UNIT - III AC VOLTAGE CONTROLLERS AND CYCLOCONVERTERS						
1	Define AC voltage regulator	The converter which converts fixed AC to Variable AC with change in Magnitude of source	Remember	CO3	CLO7	AEE010.07
2	Define TRIAC	TRIAC is a three-electrode semiconductor device that will conduct in either direction when triggered by a positive or negative signal at the gate electrode	Remember	CO3	CLO7	AEE010.07
3	Describe integral cycle control	Integral cycle control is the method used for direct conversion of AC to AC by making m number of cycles on and n number of cycles off	Understand	CO3	CLO8	AEE010.08
4	Describe phase angle control	Phase control is the method used for direct conversion of AC to AC by making use of firing angle control from 0 to 180 degrees of thyristors	Understand	CO3	CLO8	AEE010.08
5	What is the acronym for TRIAC	TRIAC, from Triode for Alternating Current, is a general trade name for an electronic component that can conduct current in either direction when it is triggered, and is formally called a bidirectional triode thyristor or bilateral triode thyristor	Understand	CO3	CLO7	AEE010.07
6	Define cycloconverter	Cycloconverter is a single stage conversion device which provides a Variable voltage, variable frequency supply	Remember	CO3	CLO9	AEE010.09
7	Describe blocked mode cycloconverters	The positive converter will provide the necessary voltage when there is positive load current. At that time, the negative converter will be in the blocked condition. During the negative load current, the negative converter will provide the necessary voltage and at that time, the negative converter will be in the blocked condition. This type of operation is	Understand	CO3	CLO9	AEE010.09

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		known as blocking mode operation and the converters which use this method of operation are termed as blocking mode cycloconverters				
8	Describe Circulating current Cycloconverters	In this type of converter, both converters are in the operating state at a time. Sometimes, the supply will get short circuited when both converters are enabled. The intergroup reactor (IGR) is connected in between the converters to avoid this short circuiting.	Understand	CO3	CLO9	AEE010.09
9	Define step up cycloconverter	The output frequency of the cycloconverter is greater than the input frequency therefore it is called as step up cycloconverter	Remember	CO3	CLO9	AEE010.09
10	Describe load commutated cycloconverter	Load commutated cycloconverter is a naturally commutated converter in which the output frequency and voltage can be controlled independently and continuously	Understand	CO3	CLO9	AEE010.09
11	Describe negative converter group	The part of the cycloconverter circuit that permits the flow of current during negative half cycle of output current is called negative converter group	Understand	CO3	CLO9	AEE010.09
12	Describe forced commutation in cycloconverter	Forced commutation is used in step up cycloconverters in order to get high frequencies need to commute the thyristors before natural zero	Understand	CO3	CLO9	AEE010.09
13	Describe the function of cycloconverter	Cycloconverter converts fixed AC voltage to variable AC voltage with change in frequency	Understand	CO3	CLO9	AEE010.09
14	Describe positive converter group	The part of the cycloconverter circuit that permits the flow of current during positive half cycle of output current is called positive converter group	Understand	CO3	CLO9	AEE010.09
15	Define step down cycloconverter	The output frequency of the cycloconverter is less than the input frequency therefore it is called as step down cycloconverter	Remember	CO3	CLO9	AEE010.09
UNIT – IV						
DC – DC CONVERTERS						
1	Define chopper	A chopper is a device that converts fixed DC input to a variable DC output voltage directly	Remember	CO4	CLO10	AEE010.10
2	Describe duty cycle	A duty cycle or power cycle is the fraction of one period in which a signal or system is active. Duty cycle is commonly expressed as a percentage or a ratio. A period is the time it takes for a signal to complete an on-and-off cycle	Understand	CO4	CLO10	AEE010.10
3	Describe current limit control	The chopper is turned ON when the flow of current spreads the minimum level. This technique can be utilized either when the ON time T is endless or when the frequency $f=1/T$	Understand	CO4	CLO10	AEE010.10
4	Define time ratio control	In time ratio control either T_{ON} OR T can be varied in order to change the duty ratio for varying output voltage of the chopper	Remember	CO4	CLO10	AEE010.10
5	Define constant	In constant frequency control the time period T is fixed and T_{ON} only varies in	Remember	CO4	CLO10	AEE010.10

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
	frequency control	order to change the duty ratio for varying output voltage of the chopper				
6	Define variable frequency control	In variable frequency control the on time period T_{ON} is fixed and T only varies in order to change the duty ratio for varying output voltage of the chopper	Remember	CO4	CLO10	AEE010.10
7	Define step down chopper	When output voltage is less than the input voltage then the chopper is called step down chopper	Remember	CO4	CLO11	AEE010.11
8	Define step up chopper	When output voltage is greater than the input voltage then the chopper is called step up chopper	Remember	CO4	CLO11	AEE010.11
9	Describe type-A chopper	Type A Chopper is known as first quadrant chopper or type A chopper. When the chopper is on, $v_0 = V_S$	Understand	CO4	CLO11	AEE010.11
10	Describe type-B chopper	The type B chopper works in second quadrant it means that the output voltage positive and output current negative. This type of chopper is called as step up chopper because the output voltage is greater than the input voltage	Understand	CO4	CLO11	AEE010.11
11	Describe type-C chopper	The type C chopper is parallel combination of type A and type B chopper. The output voltage is always positive but output current either positive or negative in this type of chopper therefore it works in first as well as second quadrant	Understand	CO4	CLO11	AEE010.11
12	Describe type-D chopper	This chopper works in first as well as fourth quadrant therefore the output current remain positive but output voltage may be either positive or negative	Understand	CO4	CLO11	AEE010.11
13	Describe type-E chopper	The type E chopper is a four quadrant chopper. The type E chopper is parallel combination of two type C choppers	Understand	CO4	CLO11	AEE010.11
14	Define buck boost chopper	The buck boost chopper is a type of DC-to-DC converter that has an output voltage magnitude that is either greater than or less than the input voltage magnitude	Remember	CO4	CLO12	AEE010.12
15	Describe switched mode regulator	A voltage regulator that uses a switching element to transform the supply into an alternating current, which is then converted to a different voltage using capacitors, inductors, and other elements, then converted back to DC. The circuit includes regulation and filtering components to insure a steady output	Understand	CO4	CLO12	AEE010.12
UNIT – V INVERTERS						
1	Describe current source inverter	Current source inverter is a kind of D.C. link converter, which is a two stage conversion device with current in one direction and voltage in two directions	Understand	CO5	CLO15	AEE010.15
2	Describe voltage source inverter	Voltage source inverter is a kind of D.C. link converter, which is a two stage conversion device with voltage in one direction and current in two directions	Understand	CO5	CLO15	AEE010.15
3	Describe the commutation	The commutation of the inverter is load dependent. The load parameters form a part	Understand	CO5	CLO15	AEE010.15

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
	of the current source inverter	of the commutation circuit. The inverter must necessarily be a forced commutated one				
4	Define pulse width modulation	Pulse width modulation is the process in which signal is transmitted by pulses with a special technique	Remember	CO5	CLO14	AEE010.14
5	Define inversion	Converter which takes power from DC terminals and transfers it to AC mains is called inversion	Remember	CO5	CLO13	AEE010.13
6	Describe series inverter	In series inverter, the commutating elements L and C are connected in series with the load in order to provide commutation. This constitutes a series RLC resonant circuit	Understand	CO5	CLO13	AEE010.13
7	Describe parallel inverter	During the working of parallel inverter, capacitor C comes in parallel with the load via the transformer, the parallel elements provides commutation in this circuit.	Understand	CO5	CLO13	AEE010.13
8	Define ideal switch	Ideal switch is a switch that not consume or dissipate any power from its sources	Remember	CO5	CLO13	AEE010.13
9	Describe forced commutation in inverters	In a half wave inverter circuit, forced commutation is essential when the load is resistive because no natural zero occurs	Understand	CO5	CLO13	AEE010.13
10	Define Total Harmonic Distortion	Total Harmonic Distortion is the ratio of rms value of all the harmonic components to the rms value of the fundamental component	Remember	CO5	CLO13	AEE010.13
11	Describe variable voltage and variable frequency	Control of frequency and control of voltage in 3-phase inverters is possible through inverter control of frequency and through converter control for voltage	Understand	CO5	CLO14	AEE010.14
12	Describe 120 degree mode of operation	In 120° mode of conduction, each electronic device is in a conduction state for 120°. It is most suitable for a delta connection in a load because it results in a six-step type of waveform across any of its phases. Therefore, at any instant only two devices are conducting because each device conducts at only 120°	Understand	CO5	CLO14	AEE010.14
13	Describe 180 degree mode of operation	In 180° mode of conduction, every device is in conduction state for 180° where they are switched ON at 60° intervals. The terminals A, B and C are the output terminals of the bridge that are connected to the three-phase delta or star connection of the load	Understand	CO5	CLO14	AEE010.14
14	Define sinusoidal pulse width modulation	The sinusoidal PWM waveform is obtained by comparing the desired modulated waveform with a triangular waveform of high frequency. Regardless of whether the voltage of the signal is smaller or larger than that of the carrier waveform, the resulting output voltage of the DC bus is either negative or positive	Remember	CO5	CLO13	AEE010.13
15	Define multiple pulse width	The multiple PWM has numerous outputs that are not the same in value but the time period over which they are produced is	Remember	CO5	CLO13	AEE010.13

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
	modulation	constant for all outputs. Inverters with PWM are able to operate at high voltage output				

Signature of the Faculty

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