NANDHA ENGINEERING COLLEGE
(Autonomous)

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

ACADEMIC YEAR 2021-2022 ODD SEMESTER

POWER ELECTRONICS - QUESTION BANK

UNIT – 1 POWER SEMICONDUCTOR DEVICES

PART – A (1 MARKS)

A 1	An SCR behaves as a ……. switch	
	a) unidirectional	b) bidirectional
	c) mechanical	d) none of these
A 2	The normal way to turn on a SCR is by ……..	
	a) appropriate gate current	b) appropriate anode current
	c) break over voltage	d) threshold voltage
A 3	An SCR is turned off when ……..	
	a) anode current is reduced to zero	b) gate voltage is reduced to zero
	c) gate is reverse biased	d) anode current is made to maximum
A4	When SCR starts conducting, then ……. loses all control	
	a) gate	b) cathode
	c) anode	d) none of these
A5	In a thyristor, dv/dt protection is achieved through the use of	
	a) RC across thyristor	b) R across thyristor
	c) C across thyristor	d) RC series connection with thyristor
A6	Comparing a triac & SCR	
	a) an SCR has less time for turn off than Triac	b) both are unidirectional
	c) both are bidirectional	d) All the above
A7	The TRIAC can be represented by	
	a) two SCRs in anti-parallel	b) two SCRs in parallel
	c) two diodes in anti-parallel	d) two diodes in parallel
A8	The TRIAC is most sensitive in the _____ quadrants	
	a) 1st with positive gate current & 3rd with negative gate current	b) 1st with positive gate current & 3rd with positive gate current
	c) 1st & 3rd with positive gate current	d) 1st & 3rd with negative gate current
A9	The GTO can be turned off by a ----------	
	a) negative gate pulse	b) positive gate pulse
	c) negative anode-cathode voltage	d) removing the gate pulse
A10	Latching current for the GTOs is _____ as compared to CTs (Conventional thyristors)	
	a) more	b) less
	c) constant	d) cannot be said
A11	GTOs have _____ as compared to the CTs.	
	a) faster switching speed	b) higher reverse blocking capabilities

	c) less on-state voltage drop	**d) less gate drive losses**
A12	**Choose the correct statement**	
	a) MOSFET is a voltage controlled device	**b) MOSFET is a uncontrolled device**
	c) MOSFET is a temperature controlled device	**d) MOSFET is a current controlled device**
A13	**Which among the following devices is the most suited for high frequency applications?**	
	a) MOSFET	**b) IGBT**
	c) BJT	**d) SCR**
A14	**In an IGBT, during the turn-on time**	
	a) Vce decreases	**b) Ic decreases**
	c) Vge decreases	**d) none of the mentioned**
A15	**The SOAs provided by the manufacturers are for**	
	a) single pulse operation & a particular temperature	**b) multi pulse operation & all the temperature**
	c) all the conditions	**d) a particular duty cycle operation**
A16	**For an SCR in the forward blocking mode (practically), the leakage current ----------**	
	a) flows from anode to cathode	**b) flows from cathode to anode**
	c) flows from gate to anode	**d) does not flow**
A17	**The latching current is _____ than the holding current**	
	a) higher	**b) same as**
	c) lower	**d) None of these**
A18	**Gold doped GTOs has _____ requirement as compared to the conventional GTOs**	
	a) low negative gate current	**b) lower positive gate current**
	c) high turn-off time	**d) None of these**

S.No	Part – B	Marks	CO	BTL	Topic in Syllabus
1	Define power electronics and give the applications.	**2**	**CO1**	**U**	Introduction
2	List the types of power transistors.	**2**	**CO1**	**R**	Introduction
3	Define holding current of SCR.	**2**	**CO1**	**U**	SCR
4	Define Latching current of SCR.	**2**	**CO1**	**U**	SCR
5	Delineate TRIAC.	**2**	**CO1**	**R**	TRIAC
6	Write down the applications of TRIAC.	**2**	**CO1**	**R**	TRIAC
7	Draw the symbol of GTO and BJT.	**2**	**CO1**	**R**	GTO and BJT

8	State the advantages of GTO over SCR.	**2**	**CO1**	**U**	GTO
9	Power BJT is current controlled device. Justify your answer.	**2**	**CO1**	**An**	BJT
10	Power MOSFET is voltage controlled device. Justify your answer.	**2**	**CO1**	**An**	MOSFET
11	Mention the different types of power MOSFETs.	**2**	**CO1**	**R**	MOSFET
12	IGBT is very popular nowadays, Justify your answer.	**2**	**CO1**	**R**	IGBT
13	IGBT is called as voltage controlled device. Justify your answer.	**2**	**CO1**	**An**	IGBT
14	Distinguish between BJT and MOSFET.	**2**	**CO1**	**An**	BJT, MOSFET
15	Write down the difference between MOSFET and IGBT.	**2**	**CO1**	**An**	MOSFET, IGBT
16	List out the parameters involved in the switching losses of power devices.	**2**	**CO1**	**R**	Switching of power semi conducting devices
17	Define (SOA) safe operating area of power semiconducting devices.	**2**	**CO1**	**U**	Safe operating area
18	Mention the different methods to turn on the thyristors.	**2**	**CO1**	**R**	Triggering of SCR
19	Define commutation of SCR and list its types.	**2**	**CO1**	**R**	Commutation of SCR
20	Portray snubber circuit.	2	CO1	U	Design of driver and snubber circuit
21	Write down the applications of MOSFET.	2	CO1	R	Power semiconducting devices
22	Write down the applications of IGBT.	2	CO1	R	Power semiconducting devices
23	Write down the applications of SCR.	2	CO1	R	Power semiconducting devices

S.No	**Part – C & D**	**Marks**	**CO**	**BTL**	**Topic in Syllabus**
1	Elucidate the construction of SCR with neat sketch.	**7**	**CO1**	**U**	SCR structure
2	Illustrate the different modes of operation of thyristor with the help of static VI	**7**	**CO1**	**An**	SCR operation and steady state characteristics

	characteristics.				
3	Draw the dynamic characteristics of SCR and explain it.	**7**	**CO1**	**An**	SCR switching characteristics
4	Summarize the different modes of operation of TRIAC with the help of VI characteristics	**8**	**CO1**	**An**	TRIAC structure, operation and charateristics
5	With a neat waveform, explain the switching characteristics of MOSFET.	**7**	**CO1**	**An**	Dynamic charateristics - MOSFET
6	With a neat waveform, explain the switching characteristics of BJT.	**7**	**CO1**	**U**	Dynamic charateristics - BJT
7	With a neat waveform, explain the switching characteristics of IGBT.	**7**	**CO1**	**An**	Dynamic charateristics - IGBT
8	Summarize the different methods for turning off (commutation) an SCR with necessary circuits.	**14**	**CO1**	**Ap**	Commutation of SCR
9	Illuminate the safe operating area of BJT.	**6**	**CO1**	**U**	Safe operating area
10	Describe about different type of over current and over voltage protection in SCR.	**7**	**CO1**	**An**	Design of driver and snubber circuits
11	Describe the gate driver circuit and base driver circuit.	**8**	**CO1**	**U**	Design of driver circuit
12	Explain the importance of isolation circuits	**7**	**CO1**	**U**	Isolation circuits

UNIT – 2 PHASE CONTROLLED CONVERTERS

A 1	**In the complete firing circuit, the driver circuit consists of**	
	a) pulse amplifier & pulse transformer	**b) pulse generator & power supply**
	c) gate leads & power supply	**d) pulse detector & pulse amplifier**
A 2	**The average output voltage is maximum when SCR is triggered at ωt = ----------**	
	a) 0	**b) π**
	c) π/2	**d) π/4**
A 3	**For a single phase half-wave thyristor circuit with R load, the input power factor is given by**	
	a) power delivered to load/input VA	**b) cos α**
	c) rms source voltage/total rms line current	**d) rms input power/power delivered to the load**
A4	**The SCR is gated at α. At ωt = π ----------**	
	a) only load voltage is zero	**b) only load current is zero**
	c) load voltage & load current are both zero	**d) both are non-zero & non negative**

A5	By using a freewheeling diode (FD) in a rectifier with RL load, the power consumed by the load	
	a) increases	b) decreases
	c) decreases to zero	d) it is not affected
A6	For a single phase thyristor circuit with R load & firing angle α, the conduction angle can be given by	
	a) π+α	b) 2π+α
	c) π-α	d) α
A7	A single-phase full controlled converted with RLE load will act like a line-commutated inverter when the firing angle α	
	a) α > 180°	b) α > 90°
	c) α < 180°	d) α = 180°
A8	In case of controlled rectifiers, the nature of the load current (continues or discontinuous) depends upon the	
	a) type of load and firing angle	b) type of load only
	c) type of firing angle only	d) it is independent of all the parameters
A9	In a single phase semi converter with resistive load and a firing angle α, each SCR and freewheeling diode would conduct for	
	a) α, 0°	b) π-α, α
	c) π+α, α	d) π-α, 0°
A10	A freewheeling diode placed across a RL load provides	
	a) fast turn-on time	b) slow turn-off time
	c) poor utilization factor	d) better power factor
A11	A single-phase symmetrical semi-converter employs	
	a) one SCR and one diode in each leg	b) two SCRs and two diodes in each leg
	c) two SCRs in each leg	d) two diodes in each leg
A12	A single-phase asymmetrical semi-converter employs	
	a) one SCR and one diode in each leg	b) two SCRs in one leg and two diodes in the other
	c) two SCRs in both the legs	d) two diodes in both the legs
A13	A three-phase, three-pulse, M-3 type controlled converter uses _____ number of SCRs	
	a) 1	b) 2
	c) 3	d) 4
A14	A three-phase three pulse type controlled converter is constructed using 3 SCR devices. The circuit is supplying an R load with α < 30°. As such, each SCR device would conduct for	
	a) 60° each cycle	b) 120° each cycle
	c) 180° each cycle	d) 360° each cycle
A15	A three-phase three-pulse converter would operate as a line commutated inverter when	
	a) 30° < α < 60°	b) 90° < α < 180°
	c) 90° > α	d) it can never operate as a line commutated inverter
A16	A three phase full converter will require _____ number of SCRs	

	a) 3	b) 6
	c) 9	d) 2
A17	A three phase six pulse full converter works as a ac to dc converter for firing angles in the range	
	a) $\alpha > 90$	b) $90 < \alpha < 180$
	c) $0 < \alpha < 90$	d) $0 < \alpha < 360$
A18	For a three phase full controlled converter, with 3 thyristors in the upper or positive group and 3 thyristors in the lower or negative group, at any given time	
	a) one thyristor is conducting from either of the groups	b) one thyristor is conducting from each group
	c) all 6 thyristors are conducting at a time	d) two thyristors are conducting from each group
A19	In case of a three phase full controlled converter with 6 SCRs, commutation occurs every	
	a) 60°	b) 30°
	c) 120°	d) 180°
A20	Dual converters provide	
	a) one quadrant operation	b) two quadrant operation
	c) three quadrant operation	d) four quadrant operation
A21	A dual converters has	
	a) two full converters in series	b) two half converters in series
	c) two full converters in anti-parallel	d) two half converters in anti-parallel
A22	The major advantage of using dual converters is that	
	a) it is cheaply available	b) it has better pf
	c) no mechanical switch is required to change the mode of operation	d) its operating frequency is very high
A23	In circulating current mode dual converters, the circulating current is avoided by	
	a) connecting a series reactor	b) maintaining $\alpha1 + \alpha2 = 180°$
	c) operating only one converter	d) adding an extra SCR

S.No	Part – B	Marks	CO	BTL	Topic in Syllabus
1	List out the various types of power electronics converters.	2	CO2	R	Introduction
2	Mention some of the applications of phase controlled rectifier.	2	CO2	R	Introduction
3	Define phase control.	2	CO2	U	Introduction
4	Classify different types of controlled rectifier.	2	CO2	R	Introduction
5	Clarify two pulse converters and state its examples.	2	CO2	R	2 pulse converter
6	Define delay or firing angle.	2	CO2	U	2 pulse converter
7	State the function of freewheeling diode in	2	CO2	U	2 pulse converter

	controlled rectifiers.				
8	Mention the advantages of freewheeling diode in a controlled rectifier.	**2**	**CO2**	**R**	2 pulse converter
9	Compare half controlled and fully controlled bridge rectifier.	**2**	**CO2**	**An**	2 pulse converter
10	Define commutation or overlap angle.	**2**	**CO2**	**U**	Effect of source inductance
11	Mention the different methods of firing circuits for line commutated converter?	**2**	**CO2**	**R**	Gate circuit schemes for phase control
12	Give an expression for average dc voltage of single phase semi converters with R load.	**2**	**CO2**	**R**	2 pulse converters
13	Give an expression for average dc voltage of single phase semi converters with RL load.	**2**	**CO2**	**R**	2 pulse converters
14	Give an expression for average dc voltage of three phase half wave controlled rectifier R load.	**2**	**CO2**	**R**	3 pulse converters
15	Give an expression for average voltage of three phase half wave controlled rectifier RL load.	**2**	**CO2**	**R**	3 pulse converters
14	State the advantages of six pulse converters than the three pulse converters.	**2**	**CO2**	**U**	6 pulse converters
15	Define input power factor.	**2**	**CO2**	**R**	Performance parameters
16	Categorize the performance factors of line commutated converters?	**2**	**CO2**	**R**	Performance parameters
17	Write down the formula of THD.	**2**	**CO2**	**R**	Performance parameters
18	Delineate dual converter and write its types.	**2**	**CO2**	**U**	Single and three phase dual converters

S.No	Part – C & D	Marks	CO	BTL	Topic in Syllabus
1	Elucidate the working of 1Φ half controlled bridge converters with R load using relevant waveforms. Also derive the average output dc voltage equation.	**14**	**CO2**	**An**	2 pulse converter
2	Explicate the working of 1Φ half controlled bridge converters with RL load using relevant waveforms. Also derive the average output dc voltage equation.	**14**	**CO2**	**An**	2 pulse converter

3	Illuminate the working of 1Φ half controlled bridge converters with RLE load using relevant waveforms. Also derive the average output dc voltage equation.	**14**	**CO2**	**An**	2 pulse converter
4	Explain the working of 1Φ fully controlled bridge converters with R load using relevant waveforms. Also derive the average output dc voltage equation.	**14**	**CO2**	**An**	2 pulse converter
5	Demonstrate the working of 1Φ fully controlled bridge converters with RL load using relevant waveforms. Also derive the average output dc voltage equation.	**14**	**CO2**	**An**	2 pulse converter
6	Illustrate the working of 1Φ fully controlled bridge converters with RLE load using relevant waveforms. Also derive the average output dc voltage equation.	**14**	**CO2**	**An**	2 pulse converter
7	Illuminate the working of 3Φ half wave controlled rectifiers with R load using relevant waveforms. Also derive the average output dc voltage equation.	**14**	**CO2**	**An**	3 pulse converter
8	Elucidate the working of 3Φ half wave controlled rectifiers with RL load using relevant waveforms. Also derive the average output dc voltage equation.	**14**	**CO2**	**An**	3 pulse converter
9	Explain the working of 3Φ half controlled bridge rectifiers with R load using relevant waveforms. Also derive the average output dc voltage equation.	**14**	**CO2**	**An**	3 pulse converter
10	Formulate the working of 3Φ half controlled bridge rectifiers with RL load using relevant waveforms. Also derive the average output dc voltage equation.	**14**	**CO2**	**An**	3 pulse converter
11	Illuminate the working of 3Φ fully controlled bridge rectifiers with RLE load using relevant waveforms. Also derive the average output dc voltage equation.	**14**	**CO2**	**An**	6 pulse converter
12	Expound the working of single phase fully controlled rectifier with source inductance with necessary wave forms. Also derive the average output dc voltage.	**14**	**CO2**	**An**	Effect of source inductance
13	Expound the working of three phase fully controlled bridge rectifier with source inductance with necessary wave forms. Also derive the average output dc voltage.	**14**	**CO2**	**An**	Effect of source inductance

14	Illustrate the operation of single phase dual converters with relevant circuit and waveforms.	**7**	**CO2**	**U**	Single phase Dual converters
15	Illustrate the operation of three phase dual converters with relevant circuit and waveforms.	**8**	**CO2**	**U**	Three phase Dual converters

UNIT – 3 DC TO DC CONVERTERS

A 1	**A chopper may be thought as a**	
	a) Inverter with DC input	**b) DC equivalent of an AC transformer**
	c) DC equivalent of an AC transformer	**d) DC equivalent of an induction motor**
A 2	**Which device can be used in a chopper circuit?**	
	a) BJT	**b) MOSFET**
	c) GTO	**d) All of these**
A 3	**What is the duty cycle of a chopper?**	
	a) Ton/Toff	**b) Toff/Ton**
	c) Ton/T	**d) T/Ton**
A4	**The load voltage of a chopper can be controlled by varying the**	
	a) Duty cycle	**b) firing angle**
	c) Reactor position	**d) Extinction angle**
A5	**Find the output voltage expression for a step down chopper with Vs as the input voltage and α as the duty cycle**	
	a) Vo = 2Vs/απ	**b) Vo = Vs/α**
	c) Vo = Vs2/α	**d) Vo = Vs x α**
A6	**For a step-up chopper, when the duty cycle is increased the average value of the output voltage**	
	a) increases	**b) Decreases**
	c) Remains the same	**d) none of the mentioned**
A7	**For a step-up/step-down chopper, if α (duty cycle) = 0.5 then**	
	a) Vo < Vs	**b) Vo = Vs**
	c) Vo > Vs	**d) none of the mentioned**
A8	**In constant frequency TRC or pulse width modulation scheme, _____ is varied**	
	a) Vs	**b) T**
	c) Ton	**d) f**
A9	**In case of frequency modulation system, _____ is kept constant**	
	a) T	**b) Ton**
	c) Toff	**d) either Ton or Toff**
A10	**In the current limit control method, the chopper is switched off when**	
	a) load current reaches the lower limit	**b) load current reaches the upper limit**
	c) load current falls to zero	**d) none of these**
A11	**For the type E chopper to be operated in the fourth quadrant**	
	a) only one switch is operated	**b) two switches are operated**
	c) three switches are operated	**d) all the switches are operated**
A12	**Indicate the converter is used for regenerative breaking of DC motors**	

	a) Buck converter	b) Boost converter
	c) Buck-Boost converter	d) Cuk converter
A13	Inductor and Capacitor in Buck converter are used to _____	
	a) Increase the cost	b) Decrease the cost
	c) Increase the harmonics	d) Filter out the harmonics
A14	Which of the following statements is true of a Buck-Boost Converter?	
	a) The output power may be less than, or greater than the input power	b) The output voltage is always greater than the input voltage
	c) The output current is always greater than the input current	d) The output voltage may be less than, or greater than the input voltage
A15	Cuk-converter is better than Buck converter in terms of the output voltage	
	a) true	b) false
	c) none of these	
A16	The controller section of SMPS consists of	
	a) Line filter	b) Power good signal
	c) Pulse width modulator circuit	d) Push pull converter
A17	Buck-Boost acts as Buck converter for duty cycle is equal to ----------	
	a) 0.6	b) 0.9
	c) 0.4	d) 0.7
A18	SMPS is used for	
	a) obtaining controlled ac power supply	b) obtaining controlled dc power supply
	c) storage of dc power	d) switch from one source to another

S.No	Part – B	Marks	CO	BTL	Topic in Syllabus
1	Define Chopper.	2	CO3	R	Chopper Introduction
2	State the principle of operation of step down chopper.	2	CO3	U	Step down chopper
3	State the principle of operation of step up chopper.	2	CO3	U	Step up chopper
4	List the control strategies of dc chopper.	2	CO3	R	Control strategy
5	Define duty cycle and give its formula.	2	CO3	U	Step down and step up chopper
6	Write down the expression for average output voltage for step down chopper.	2	CO3	R	Step down chopper
7	Write down the expression for average output voltage for step up chopper.	2	CO3	R	Step up chopper
8	Give some applications of dc choppers.	2	CO3	R	Chopper introduction
9	List out the methods for obtaining the	2	CO3	R	Chopper

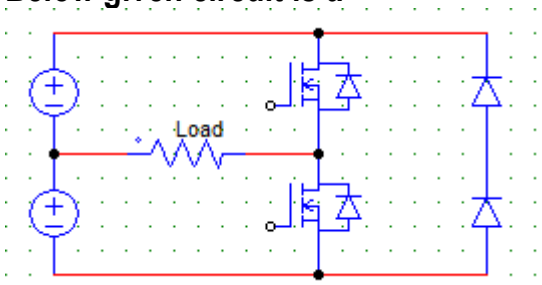
	variable dc voltage from fixed dc voltage.				introduction
10	Mention the advantages of chopper control provides.	**2**	**CO3**	**R**	Control strategy
11	Identify the term TRC in dc chopper.	**2**	**CO3**	**U**	Control strategy
12	Point out CLC of dc chopper.	**2**	**CO3**	**U**	Control strategy
13	Define (FM) frequency modulation.	**2**	**CO3**	**U**	Control strategy
14	Define (PWM) pulse width modulation.	**2**	**CO3**	**U**	Control strategy
15	Outline switched mode regulators.	**2**	**CO3**	**U**	Switched mode regulators
16	Mention the types of switched mode regulators.	**2**	**CO3**	**R**	Switched mode regulators
17	List the applications of (SMPS) switched mode regulators.	**2**	**CO3**	**R**	Switched mode regulators
18	Write the disadvantages of frequency modulation.	**2**	**CO3**	**R**	Control strategy
19	Mention the applications of Boost converters.	**2**	**CO3**	**R**	Switched mode regulators
20	Portray Buck-Boost converter.	**2**	**CO3**	**U**	Switched mode regulators

S.No	Part – C & D	Marks	CO	BTL	Topic in Syllabus
1	Explicate the operating principle of step down chopper with neat circuit and waveform.	**7**	**CO3**	**U**	Step down chopper
2	Elucidate the operating principle of step up chopper with neat circuit and waveform.	**7**	**CO3**	**U**	Step up chopper
3	Derive an expression for output voltages in terms of duty cycle for a step up and step down chopper.	**8**	**CO3**	**An**	Step down and step up chopper
4	Summarize the methods of controlling the output voltage of a chopper.	**8**	**CO3**	**An**	Control Strategy
5	Illustrate the working principle of type E or four quadrant chopper with neat sketch.	**7**	**CO3**	**U**	Operation of four quadrant chopper
6	Demonstrate the working operation of Buck converter with relevant circuit and waveform. Also derive its average output	**14**	**CO3**	**An**	SMPS-Buck converter

	dc voltage in terms of duty cycle, peak to peak inductor current and capacitor voltage.				
7	Exhibit the working operation of Boost converter with relevant circuit and waveform. Also derive its average output dc voltage in terms of duty cycle, peak to peak inductor current and capacitor voltage.	**14**	**CO3**	**An**	SMPS-Boost converter
8	Elucidate the working operation of Buck-Boost converter with relevant circuit and waveform. Also derive its average output dc voltage in terms of duty cycle, peak to peak inductor current and capacitor voltage.	**14**	**CO3**	**An**	SMPS-Buck Boost converter
9	Explain the working operation of cuk converter with relevant circuit and waveform. Also derive its average output dc voltage in terms of duty cycle, peak to peak inductor current and capacitor voltage.	**14**	**CO3**	**An**	SMPS-cuk converter

UNIT – 4 INVERTERS

A 1	**Inverters converts**	
	a) dc power to dc power	**b) ac power to dc power**
	c) dc power to ac power	**d) ac power to ac power**
A 2	**_____ based inverters do not require self-commutation.**	
	a) IGBT	**b) MOSFET**
	c) SCR	**d) GTO**
A 3	**In a single-phase half wave inverter _____ SCR(s) are/is gated at a time.**	
	a) 1	**b) 2**
	c) 3	**d) 4**
A4	**In a single-phase full wave inverter _____ SCR(s) are/is gated at a time.**	
	a) 1	**b) 2**
	c) 3	**d) 4**
A5	**Safe commutation can be achieved in case of the _____ operating mode.**	
	a) 180°	**b) 120°**
	c) 360°	**d) None of these**
A6	**In current source inverters**	
	a) L filter is used before the CSI (input side)	**b) L filter is used after the CSI (load side)**
	c) C filter is used before the CSI (input side)	**d) C filter is used after the CSI (load side)**
A7	**In the PWM voltage control method**	
	a) external commutating capacitors are required	**b) higher order harmonics are minimized**
	c) more average output voltage can be obtained	**d) lower order harmonics are minimized**

A8	In a VSI (Voltage source inverter)	
	a) the internal impedance of the DC source is negligible	b) the internal impedance of the DC source is very very high
	c) the internal impedance of the AC source is negligible	d) the IGBTs are fired at 0 degrees
A9	Single phase half bridge inverters requires	
	a) two wire ac supply	b) two wire dc supply
	c) three wire ac supply	d) three wire dc supply
A10	The output voltage from a single phase full wave bridge inverter varies from	
	a) Vs to zero	b) Vs/2 to zero
	c) Vs to –Vs	d) Vs/2 to Vs/2
A11	Below given circuit is a 	
	a) SCR based inverter	b) GTO based inverter
	c) IGBT based inverter	d) BJT based inverter
A12	The output of a single-phase half bridge inverter on R load is ideally	
	a) a sine wave	b) a square wave
	c) a triangular wave	d) constant dc
A13	The Total Harmonic Distortion (THD) is the ratio of	
	a) rms value of all the harmonic components to the rms value of the fundamental component	b) average value of all the harmonic components to the rms value of the fundamental component
	c) rms value of all the third harmonic component to the rms value of the fundamental component	d) rms value of all the fundamental component to the rms value of all the harmonic components
A14	In voltage fed thyristor inverters _____ commutation is required	
	a) load	b) forced
	c) self	d) any commutation technique can be used
A15	A three-phase bridge inverter requires minimum of _____ switching devices	
	a) 3	b) 4
	c) 6	d) 8
A16	In the three-phase bridge inverter, each step consists of	
	a) 30°	b) 60°
	c) 90°	d) will depend on the value of the firing angle
A17	In the 180° mode VSI, _____ devices conduct at a time	
	a) 2	b) 3
	c) 4	d) 5

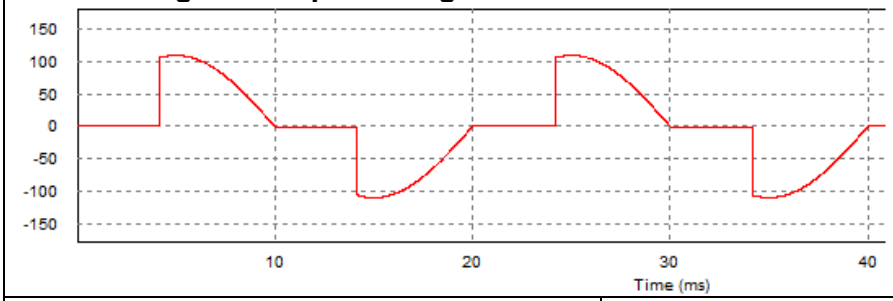
S.No	Part – B	Marks	CO	BTL	Topic in Syllabus
1	Define inverter.	**2**	**CO4**	**R**	Introduction
2	Mention the applications of an inverter.	**2**	**CO4**	**R**	Introduction
3	Classify the main types of an inverter.	**2**	**CO4**	**R**	Introduction
4	List the types of inverter.	**2**	**CO4**	**R**	Introduction
5	Thyristors are not preferred for inverters, justify the answer.	**2**	**CO4**	**U**	Introduction
6	Define VSI.	**2**	**CO4**	**U**	Voltage source inverter
7	Justify the answer - diodes should be connected antiparallel with thyristors in inverter circuits. Or What is meant by feedback diode in inverter circuit?	**2**	**CO4**	**U**	Voltage source inverter
8	Write the types of single phase inverters.	**2**	**CO4**	**R**	Single phase bridge inverter
9	Mention the two possible modes in order to fire the thyristors in three phase inverter.	**2**	**CO4**	**R**	Three phase voltage source inverter
10	Compare 120^0 mode with 180^0 mode of three phase inverter.	**2**	**CO4**	**An**	Three phase voltage source inverter
11	Write the advantage of 120^0 mode inverter over 180^0 mode.	**2**	**CO4**	**An**	Three phase voltage source inverter
12	Delineate PWM control.	**2**	**CO4**	**U**	Voltage control using PWM technique
13	State the advantages of PWM control.	**2**	**CO4**	**R**	Voltage control using PWM technique
14	List the different methods of PWM techniques.	**2**	**CO4**	**R**	Voltage control using PWM technique
15	Define Modulation index (MI) or Amplitude modulation index (AMI).	**2**	**CO4**	**U**	Voltage control using PWM technique
16	Mention the methods to reduce the	**2**	**CO4**	**R**	Harmonic

	harmonic contents.				reduction
17	List the disadvantages of the harmonics content present in inverter system.	**2**	**CO4**	**R**	Harmonic reduction
18	Define CSI.	**2**	**CO4**	**U**	Current source inverters
19	Give the advantages of current source inverter.	**2**	**CO4**	**R**	Current source inverters
20	Compare voltage source inverter with current source inverter.	**2**	**CO4**	**An**	Current source inverters

S.No	Part –C & D	Marks	CO	BTL	Topic in Syllabus
1	Elucidate the operation of single phase half bridge inverter with a neat sketch.	**7**	**CO4**	**U**	Single phase inverters
2	Elucidate the operation of single phase full bridge inverter with a neat sketch.	**7**	**CO4**	**U**	Single phase inverters
3	Expound the 180^0 conduction mode of firing operation of three phase inverter with relevant circuit and waveforms.	**14**	**CO4**	**An**	Three phase inverters
4	Illuminate the 120^0 conduction mode of firing operation of three phase inverter with relevant circuit and waveforms.	**14**	**CO4**	**An**	Three phase inverters
5	Demonstrate the various PWM techniques used for voltage control in inverters with necessary waveforms.	**10**	**CO4**	**An**	Voltage control of PWM techniques
6	Illustrate the working operation of current source inverter with neat sketch.	**7**	**CO4**	**U**	Current source inverters

UNIT – 5 AC TO AC CONVERTERS

A 1	**AC voltage controllers convert ---------- voltage**	
	a) fixed ac to variable dc	**b) fixed dc to variable dc**
	c) fixed dc to variable dc	**d) variable ac to variable dc**
A 2	**Earlier then the semiconductor technology, _____ devices were used for voltage control applications**	
	a) vacuum tubes	**b) tap changing transformer**
	c) induction machine	**d) Cycloconverters**
A 3	**The AC voltage controllers are used in _____ applications**	
	a) power generation	**b) electric heating**
	c) conveyor belt motion	**d) power transmission**
A4	**In AC voltage controllers the ---------- is obtained**	
	a) variable dc with fixed frequency	**b) variable dc with variable frequency**

	c) C. variable ac with fixed frequency	d) D. variable ac with variable frequency
A5	In the principle of phase control	
	a) the load is on for some cycles and off for some cycles	b) control is achieved by adjusting the number of on off cycles
	c) control is achieved by adjusting the firing angle of the devices	d) control cannot be achieved
A6	A single-phase half wave voltage controller consists of	
	a) one SCR is parallel with one diode	b) one SCR is anti-parallel with one diode
	c) two SCRs in parallel	d) two SCRs in anti-parallel
A7	The below given output voltage waveform can be obtained by a 	
	a) half wave ac voltage controller	b) full wave ac voltage controller
	c) full wave inverter	d) None of these
A8	Three phase full wave ac voltage controller is also called as	
	a) Unidirectional controller	b) Bidirectional controller
	c) None of these	d)
A9	A cycloconverter is a _____	
	a) one stage power converter	b) one stage voltage converter
	c) one stage frequency converter	d) none of the mentioned
A10	Applications of cyclo converters include	
	a) Speed control of ac drives	b) induction heating
	c) Static VAR compensation	d) All of these
A11	The single phase mid-point type cycloconverter uses _____ number of SCRs	
	a) 4	b) 6
	c) 8	d) None of these
A12	In a three phase half-wave cycloconverter _____	
	a) both inverting and converting action takes place	b) only inversion action takes place
	c) only conversion action takes place	d) None of these
A13	A 3-phase to 3-phase cycloconverter requires	
	a) 18 SCRs for 6-pulse device	b) 36 SCRs for 3-pulse device
	c) 36 SCRs for 6-pulse device	d) None of these
A14	An intergroup reactor is used in a 1-phase cycloconverter circuit to	
	a) reduce current ripples	b) reduce voltage ripples
	c) limit circulating current	d) limit di/dt in the semiconductor switch
A15	An advantage of a cycloconverter is	

	a) very good power factor	**b) requires few number of thyristors**
	c) commutation failure does not short circuit the source	**d) load commutation is possible**

S.No	Part – B	Marks	CO	BTL	Topic in Syllabus
1	Depict ac voltage controller.	**2**	**CO5**	**U**	Introduction
2	Mention the applications of ac voltage controller.	**2**	**CO5**	**R**	Introduction
3	State the merits of ac voltage controller.	**2**	**CO5**	**R**	Single phase ac voltage controller
4	List the methods of control in ac voltage controller.	**2**	**CO5**	**R**	Control Strategy
5	State about integral cycle control.	**2**	**CO5**	**U**	Control Strategy
6	Differentiate on-off control with phase control.	**2**	**CO5**	**An**	Control Strategy
7	Write the advantage and disadvantage of on-off control.	**2**	**CO5**	**R**	Control Strategy
8	Write down the expression for duty cycle in on-off control.	**2**	**CO5**	**R**	Control Strategy
9	Define cycloconverter.	**2**	**CO5**	**U**	Cyclo converter introduction
10	List the types of cycloconverter.	**2**	**CO5**	**R**	Cyclo converter introduction
11	Define step up and step down cycloconverter.	**2**	**CO5**	**U**	Cyclo converter introduction
12	Mention the applications of cyclo converter.	**2**	**CO5**	**U**	Cyclo converter introduction
13	Identify positive converter group in a cyclo converter	**2**	**CO5**	**U**	Single phase cyclo converter
14	Identify negative converter group in a cyclo converter	**2**	**CO5**	**U**	Single phase cyclo converter

S.No	Part – C & D	Marks	CO	BTL	Topic in Syllabus
1	Illustrate the working operation of single phase ac voltage controller (RL load) with neat sketches. Also derive the expression for average dc output voltage and RMS	**14**	**CO5**	**An**	Single phase ac voltage controller

	output voltage.				
2	Demonstrate the working operation of three phase ac voltage controller (R load) with neat sketches.	**8**	**CO5**	**U**	Three phase ac voltage controller
3	With neat sketches enlighten the operation of single phase to single phase cyclo converter center tapped transformer configuration type.	**7**	**CO5**	**U**	Single phase cycloconverter
4	With neat sketches enlighten the operation of single phase bridge type cyclo converter.	**7**	**CO5**	**An**	Single phase cycloconverter
5	Describe about three phase to single phase cyclo converter operations with necessary circuit and waveforms.	**8**	**CO5**	**U**	Three phase cycloconverter
6	Summarize the operation of three phase to three phase cyclo converter with relevant circuit arrangement using 18 thyristors.	**7**	**CO5**	**U**	Three phase cycloconverter
7	Discuss about power factor control.	**4**	**CO5**	**U**	Power factor control