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SCHEME: I **SEMESTER: III**

NAME OF SUBJECT: FUNDAMENTALS PF POWER ELECTRONICS

Subject Code: 22326

UNIT WISE MULTIPLE CHOICE QUESTIONS BANK

Question Bank for Multiple Choice Questions

Program: Diploma in Electrical engineering	**Program Code:- EE**
Scheme:- I	**Semester:- 3**
Course:- Fundamentals of Power Electronics	**Course Code:- 22326**

01 – Power Electronic Devices	**Marks:-08**

Content of Chapter:-

1.1 Power electronic devices.
1.2 Power transistor: construction, working principle, V-I characteristics and uses. Protection zones and backup protection
1.3 IGBT: Construction, working principle. V-I characteristics and uses.
1.4 Concept of single electron transistor (SET) – aspects of Nano-technology.

1	**What are the disadvantages of Field Effect Transistors?**	
	(A)	Higher resistance at drain
	(B)	Operation is slow
	(C)	Impedance at input is moderate
	(D)	All as mentioned earlier
Answer	Option D	

2	**Who introduced 'First Vertical Power MOSFET'?**	
	(A)	Drain
	(B)	Gate
	(C)	Base
	(D)	Source
Answer	Option C	

3	**The MOSFET combines the areas of _____ & _____**	
	(A)	field effect & MOS technology
	(B)	semiconductor & TTL
	(C)	mos technology & CMOS technology
	(D)	none of the mentioned
Answer	Option A	

4	**Which of the following terminals does not belong to the MOSFET?**	
	(A)	Drain
	(B)	Gate
	(C)	Base
	(D)	Source
Answer	Option C	
Explanation	MOSFET is a three terminal device D, G & S	

5	**Choose the correct statement**	
	(A)	MOSFET is a uncontrolled device
	(B)	MOSFET is a voltage controlled device
	(C)	MOSFET is a current controlled device
	(D)	**MOSFET is a temperature controlled device**
Answer	Option B	

6	**Choose the correct statement**	
	(A)	MOSFET is a unipolar, voltage controlled, two terminal device
	(B)	MOSFET is a bipolar, current controlled, three terminal device
	(C)	MOSFET is a unipolar, voltage controlled, three terminal device
	(D)	MOSFET is a bipolar, current controlled, two terminal device
Answer	Option C	

7	**The arrow on the symbol of MOSFET indicates**	
	(A)	that it is a N-channel MOSFET
	(B)	the direction of electrons
	(C)	the direction of conventional current flow
	(D)	that it is a P-channel MOSFET
Answer	Option B	

8	**The controlling parameter in MOSFET is**	
	(A)	a) Vds
	(B)	b) Ig
	(C)	c) Vgs
	(D)	d) Is
Answer	Option B	

9	**In the internal structure of a MOSFET, a parasitic BJT exists between the**	
	(A)	source & gate terminals
	(B)	source & drain terminals
	(C)	drain & gate terminals
	(D)	there is no parasitic BJT in MOSFET
Answer	Option B	

	In the transfer characteristics of a MOSFET, the threshold voltage is the measure of the

10	(A)	minimum voltage to induce a n-channel/p-channel for conduction
	(B)	minimum voltage till which temperature is constant
	(C)	minimum voltage to turn off the device
	(D)	none of the above mentioned is true
Answer	Option A	
Explanation	It is the minimum voltage to induce a n-channel/p-channel which will allow the device to conduct electrically through its length	

11	**The output characteristics of a MOSFET, is a plot of**	
	(A)	Id as a function of Vgs with Vds as a parameter
	(B)	Id as a function of Vds with Vgs as a parameter
	(C)	Ig as a function of Vgs with Vds as a parameter
	(D)	Ig as a function of Vds with Vgs as a parameter
Answer	Option B	

12	**In the output characteristics of a MOSFET with low values of Vds, the value of the on-state resistance is**	
	(A)	Vds/Ig
	(B)	Vds/Id
	(C)	0
	(D)	∞
Answer	Option B	
Explanation	The o/p characteristics Is a plot of Id verses Vds, which for low values of Vds is almost constant. Hence, the on-state resistance is constant & the slop is its constant value.	

13	**At turn-on the initial delay or turn on delay is the time required for the**	
	(A)	input inductance to charge to the threshold value
	(B)	input capacitance to charge to the threshold value
	(C)	input inductance to discharge to the threshold value
	(D)	input capacitance to discharge to the threshold value
Answer	Option	

14	**Choose the correct statement**	
	(A)	MOSFET suffers from secondary breakdown problems
	(B)	MOSFET has lower switching losses as compared to other devices
	(C)	MOSFET has high value of on-state resistance as compared to other devices
	(D)	All of the mentioned
Answer	Option B	
Explanation	MOSFET has lower switching losses due to its unipolar nature & less turn off time. All of the other statements are false.	

15	**Which among the following devices is the most suited for high frequency applications?**	
	(A)	BJT
	(B)	IGBT

	(C)	MOSFET
	(D)	SCR
Answer	Option C	
Explanation	MOSFET has the least switching losses among the rest of the devices	

16	**Choose the correct statement**	
	(A)	MOSFET has a positive temperature co-efficient
	(B)	MOSFET has a high gate circuit impedance
	(C)	MOSFET is a voltage controlled device
	(D)	All of the mentioned
Answer	Option D	
Explanation	MOSFETs are voltage controlled devices. They have high gate circuit impedance and are PTC devices	

18	**For a MOSFET Vgs=3V, Idss=5A, and Id=2A. Find the pinch of voltage Vp**	
	(A)	a) 4.08
	(B)	b) 8.16
	(C)	c) 16.32
	(D)	d) 0V
Answer	Option B	
Explanation	Use Id = Idd x $[1-Vgs/Vp]^2$.	

19	**Consider an ideal MOSFET. If Vgs = 0V, then Id = ?**	
	(A)	Zero
	(B)	Maximum
	(C)	Id(on)
	(D)	dd
Answer	Option A	

20	**How does the MOSFET differ from the JFET?**	
	(A)	JFET has a p-n junction
	(B)	They are both the same
	(C)	JFET is small in size
	(D)	MOSFET has a base terminal
Answer	Option	

21	**The basic advantage of the CMOS technology is that**	
	(A)	It is easily available
	(B)	It has small size
	(C)	It has lower power consumption
	(D)	It has better switching capabilities
Answer	Option C	

Explanation	Complementary MOS consumes very less power as compared to all the earlier devices.

22	**The N-channel MOSFET is considered better than the P-channel MOSFET due to its**	
	(A)	low noise levels
	(B)	TTL compatibility
	(C)	lower input impedance
	(D)	faster operation
Answer	Option D	
Explanation	The N-channel are faster than the P-channel type.	

23	**IGBT possess**	
	(A)	low input impedance
	(B)	high input impedance
	(C)	high on-state resistance
	(D)	second breakdown problems
Answer	Option B	
Explanation	MOSFET IGBT possesses high input impedance.	

24	**IGBT & BJT both posses ___**	
	(A)	low on-state power losses
	(B)	high on-state power losses
	(C)	low switching losses
	(D)	high input impedance
Answer	Option A	
Explanation	Low on state power loss is one of the best parameters of both BJT & the IGBT.	

25	**The three terminals of the IGBT are**	
	(A)	base, emitter & collector
	(B)	gate, source & drain
	(C)	gate, emitter & collector
	(D)	base, source & drain
Answer	Option C	
Explanation	IGBT is a three terminal device. It has a gate, a emitter & a collector	

26	**In IGBT, the p^+ layer connected to the collector terminal is called as the**	
	(A)	drift layer
	(B)	injection layer

	(C)	body layer
	(D)	collector Layer
Answer	Option B	
Explanation	It is called as a injection layer, because it injects holes into the n^- layer.	

27	**The controlling parameter in IGBT is the**	
	(A)	I_G
	(B)	V_{GE}
	(C)	I_C
	(D)	V_{CE}
Answer	Option B	
Explanation	The controlling parameter is the gate to emitter voltage, as the device is a voltage controlled device	

28	**In IGBT, the n^- layer above the p^+ layer is called as the**	
	(A)	drift layer
	(B)	injection layer
	(C)	body layer
	(D)	collector Layer
Answer	Option A	
Explanation	It is called as the drift layer because its thickness determines the voltage blocking capabilities of the device.	

29	**The voltage blocking capability of the IGBT is determined by the**	
	(A)	injection layer
	(B)	body layer
	(C)	metal used for the contacts
	(D)	drift layer
Answer	Option D	
Explanation	The drift layer which is a n^- layer determines the voltage blocking capabilities	

30	**The controlled parameter in IGBT is the**	
	(A)	I_G
	(B)	V_{GE}
	(C)	I_C
	(D)	V_{CE}
Answer	Option C	

Explanation	The controlling parameter is the gate to collector current.

31	**The structure of the IGBT is a**	
	(A)	P-N-P structure connected by a MOS gate
	(B)	N-N-P-P structure connected by a MOS gate
	(C)	P-N-P-N structure connected by a MOS gate
	(D)	N-P-N-P structure connected by a MOS gate
Answer	Option C	
Explanation	The IGBT is a semiconductor device with four alternating layers (P-N-P-N) that are controlled by a metal-oxide-semiconductor (MOS) gate structure without regenerative action.	

32	**The major drawback of the first generation IGBTs was that, they had**	
	(A)	latch-up problems
	(B)	noise & secondary breakdown problems
	(C)	sluggish operation
	(D)	latch-up & secondary breakdown problems
Answer	Option D	
Explanation	The earlier IGBT's had latch-up problems (device cannot turn off even after the gate signal is removed), and secondary breakdown problems (in which a localized hotspot in the device goes into thermal runaway and burns the device out at high currents).	

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02 – Thyristor family Devices	Marks:- 16

Content of Chapter:-

2.1.SCR construction, two transistor analogy, types, of working and vi characteristics
2.2 SCR mountings and cooling.
2.3 Types of thyristors: SCR ,GTO, UJT,PUT,DIAC,and TRAC
2.4 Thyristor Family Devices :symbol, construction ,operating principle
2.5 protection circuit over- voltage ,over current ,Snuber,Crowbar

1	**A thyristor (SCR) is a**	
	(A)	P-N-P device
	(B)	N-P-N device
	(C)	P-N-P-N device
	(D)	P-N device
Answer	Option C	
Explanation	An SCR (silicon controlled rectifier) is a four layer p-n-p-n type device.	

2	**Which terminal does not belong to the SCR?**	
	(A)	Anode
	(B)	Gate
	(C)	Base
	(D)	Cathode
Answer	Option C	
Explanation	The SCR is having three terminals viz. anode, cathode and the gate.	

3	**An SCR is a**	
	(A)	four layer, four junction device
	(B)	four layer, three junction device
	(C)	four layer, two junction device
	(D)	three layer, and single junction device
Answer	Option B	
Explanation	SCR is a four layer p-n-p-n device which forms three p-n junctions.	

4	**Choose the false statement.**	
	(A)	SCR is a bidirectional device
	(B)	SCR is a controlled device
	(C)	In SCR the gate is the controlling terminal
	(D)	SCR are used for high-power applications
Answer	Option A	

Explanation	It is a unidirectional device, current only flows from anode to cathode.

5	**. In the SCR structure the gate terminal is located**	
	(A)	near the anode terminal
	(B)	near the cathode terminal
	(C)	in between the anode & cathode terminal
	(D)	none of the mentioned
Answer	Option B	
Explanation	The gate is located near the cathode, because it allows fast turning on of the device when the gate signal is applied by forward basing the second junction	

6	**The static V-I curve for the SCR is plotted for**	
	(A)	Ia (anode current) vsIg (gate current), Va (anode – cathode voltage) as a parameter
	(B)	IavsVa with Ig as a parameter
	(C)	VavsIg with Ia as a parameter
	(D)	Igvs Vg with Ia as a parameter
Answer	Option B	
Explanation	The curve is plotted for IavsVa for different values of gate current Ig.	

7	**If the cathode of an SCR is made positive with respect to the anode & no gate current is applied then**	
	(A)	all the junctions are reversed biased
	(B)	all the junctions are forward biased
	(C)	c) only the middle junction is forward biased
	(D)	only the middle junction is reversed biased
Answer	Option C	
Explanation	The device is in the reverse blocking state (3rd quadrant) & only the middle junction is forward biased whereas other two are reversed biased.	

8	**For an SCR in the reverse blocking mode, (practically)**	
	(A)	leakage current does not flow
	(B)	leakage current flows from anode to cathode
	(C)	leakage current flows from cathode to anode
	(D)	leakage current flows from gate to anode
Answer	Option C	
Explanation	Explanation: In the reverse blocking mode, the gate current is zero & a reverse voltage is applied at the cathode-anode	

9		
	(A)	reverse blocking mode
	(B)	reverse conduction mode
	(C)	forward blocking mode
	(D)	forward conduction mode
Answer	Option C	

Explanation	The SCR is in the forward blocking mode with its top and bottom junctions forward biased and the middle junction reversed biased

10	**For an SCR in the forward blocking mode (practically)**	
	(A)	leakage current does not flow
	(B)	leakage current flows from anode to cathode
	(C)	leakage current flows from cathode to anode
	(D)	leakage current flows from gate to anode
Answer	Option B	
Explanation	In the forward blocking mode, the gate current is zero & only the middle J2 junction is reversed biased	

11	**The forward break over voltage is the**	
	(A)	anode-cathode voltage at which conduction starts with gate signal applied
	(B)	anode-cathode voltage at which conduction starts with no gate signal applied
	(C)	gate voltage at which conduction starts with no anode-cathode voltage
	(D)	gate voltage at which conduction starts with anode-cathode voltage applied
Answer	Option A	
Explanation	It is the forward voltage at which the middle junction breaks down without any gate signal and pushes the device into the conducting state.	

12	**For a forward conducting SCR device, as the forward anode to cathode voltage is increased**	
	(A)	the device turns on at higher values of gate current
	(B)	the device turns on at lower values of gate current
	(C)	the forward impedance of the device goes on increasing
	(D)	the forward impedance of the device goes on decreasing
Answer	Option B	
Explanation	Higher the value of anode-cathode forward voltage, lower the gate requirements of the device. Also, the forward resistance of the device is always constant as long as the junction temperature is constant	

13	**A thyristor can be bought from the forward conduction mode to forward blocking mode by**	
	(A)	the dv/dt triggering method
	(B)	applying a negative gate signal
	(C)	applying a positive gate signal
	(D)	applying a reverse voltage across anode-cathode terminals
Answer	Option D	
Explanation	a) & c) are used to turn on the device; b) will damage the SCR.	

14	**Usually the forward voltage triggering method is not used to turn-on the SCR because**	
	(A)	it increases losses
	(B)	it causes noise production
	(C)	it may damage the junction & destroy the device
	(D)	relatively it's an inefficient method

Answer	Option C
Explanation	In forward voltage triggering the middle junction breaks down without any gate signal and pushes the device into the conducting state. This method can permanently damage the J2 junction and make the device useless

15		
	(A)	gate triggering method
	(B)	dv/dt triggering method
	(C)	forward voltage triggering method
	(D)	temperature triggering method
Answer	Option A	
Explanation	d) & b) are unreliable methods, c) can permanently damage the SCR Gate triggering is simple, reliable & most efficient	

16	**The forward break over voltage is maximum when**	
	(A)	Gate current = ∞
	(B)	Gate current = 0
	(C)	Gate current = -∞
	(D)	t is independent of gate current
Answer	Option A	
Explanation	Higher the value of anode-cathode forward voltage, lower the gate requirements of the device.	

17	**For the SCR to remain in the ON (conducting) state**	
	(A)	gate signal is continuously required
	(B)	no continuous gate signal is required
	(C)	no forward anode-cathode voltage is required
	(D)	negative gate signal is continuously required
Answer	Option B	
Explanation	Unlike the transistor devices, once the SCR is turned on by the gate terminal, the gate terminal losses its control over the device	

18	**The value of anode current required to maintain the conduction of an SCR even though the gate signal is removed is called as the**	
	(A)	holding current
	(B)	latching current
	(C)	switching current
	(D)	peak anode current
Answer	Option A	
Explanation	It is the minimum anode current value required to maintain the conduction of an SCR even though the gate signal is removed. It is a very important parameter when employing an SCR in any circuit	

	In the reverse blocking mode the middle junction (J_2) has the characteristics of that of a

19	(A)	transistor
	(B)	capacitor
	(C)	inductor
	(D)	none of the mentioned
Answer	Option B	
Explanation	It is like a capacitor, as the dv/dt voltage triggering turns on the device. The charging current is given by, $I_C = C_j dV_a/dt$.	

20	**_____ are semiconductor thyristor devices which can be turned-on by light of appropriate wavelengths.**	
	(A)	LGTOs
	(B)	LASERs
	(C)	MASERs
	(D)	LASCRs
Answer	Option D	
Explanation	LASCR stands for light activated SCRs, which can be turned on in made to conduct by firing appropriate light pulses at its gate region	

21	**During the transition time or turn-on time**	
	(A)	The forward anode voltage decreases from 90 % to 10 % & the anode current also decreases from 90 to 10 % of the initial value
	(B)	The forward anode voltage increases from 10 % to 90 % & the anode current also increases from 10 % to 90 % of the initial value
	(C)	The forward anode voltage decreases from 90 % to 10 % & the anode current increases from 10 % to 90 % of the initial value
	(D)	The forward anode voltage increases from 10 % to 90 % & the anode current decreases from 90% to 10% of the initial value
Answer	Option C	
Explanation	During the turn on time, the voltage across the SCR is going down and the current through it is slowly rising as it is going into the conduction mode	

22	**For an SCR the total turn-on time consists of**	
	(A)	anode current flows only near the gate
	(B)	anode current rises from zero to very high value
	(C)	losses are maximum
	(D)	anode to cathode voltage is zero
Answer	Option A	

23	**The minimum value of anode current below which it must fall to completely turn-off the device is called as the**	
	(A)	holding current value
	(B)	latching current value
	(C)	switching current value
	(D)	peak anode current value
Answer	Option A	
Explanation	The device will remain in the conducting state unless the anode current falls below the holding current value.	

24	**For an SCR triggering methods are**	
	(A)	all
	(B)	anode to gate triggering
	(C)	thermal triggering
	(D)	dv/dt triggering
Answer	Option A	
Explanation	The losses are maximum during the rise time because both Ia&Va are high.	

25	**The latching current is _____ than the holding current**	
	(A)	lower
	(B)	higher
	(C)	same as
	(D)	negative of
Answer	Option B	
Explanation	The latching current is the value of current on which the device will remain in the on state even after removal of the gate signal. Whereas, the holding current is the threshold above which the device will work.	

26	**For effective turning off of the SCR after the anode current has reached zero value,**	
	(A)	chargers are injected by applying reverse anode-cathode voltage
	(B)	chargers are removed by applying reverse anode-cathode voltage
	(C)	chargers are injected by applying gate signal
	(D)	chargers are removed by applying gate signal
Answer	Option B	
Explanation	To enable the device to regain its reverse blocking capabilities, the stored charges in the junctions of the SCR must be removed	

27	**To avoid commutation failure**	
	(A)	circuit turn-off time must be greater than the thyristor turn-off time
	(B)	circuit turn-off time must be lesser than the thyristor turn-off time
	(C)	circuit turn-off time must be equal to the thyristor turn-off time
	(D)	none of the above mentioned
Answer	Option A	
Explanation	If the thyristor turn off time is more than the circuit turn off time, the circuit will be turned off and the thyristor will keep conducting, which is not at all desirable.	

28	**The gate characteristics of thyristor is a plot of**	
	(A)	V_g on the X-axis &I_g on the Y-axis
	(B)	I_g on the X-axis & V_g on the Y-axis
	(C)	V_a on the X-axis &I_g on the Y-axis
	(D)	I_g on the X-axis &V_a on the Y-axis
Answer	Option B	

Explanation	It is the gate current versus the gate voltage plot and gives the minimum and maximum values of gate parameters

29	**The area under the curve of the gate characteristics of thyristor gives the**	
	(A)	total average gate current
	(B)	total average gate voltage
	(C)	total average gate impedance
	(D)	total average gate power dissipation
Answer	Option D	
Explanation	As the gate characteristics is a plot of Ig vs. Vg consisting of two curves one for the maximumvalues & other for the minimum the area between them gives the total average gate power dissipation. (A very important parameter in designing of the triggering circuits).	

30	**A tangent drawn from the Y-axis to the Pavg on the gate characteristics gives the value of the**	
	(A)	maximum value of gate-source resistance
	(B)	minimum value of gate-source resistance
	(C)	maximum value of gate-source power
	(D)	minimum value of gate-source power
Answer	Option B	
Explanation	It gives the min gate to source resistance.	

31	**Higher the magnitude of the gate pulse**	
	(A)	lesser is the time required to inject the charges
	(B)	greater is the time required to inject the charges
	(C)	greater is the value of anode current
	(D)	lesser is the value of anode current
Answer	Option A	
Explanation	Lesser time is required to inject the charges & turn on the device with higher gate pulse magnitude.	

32	**The average gate power dissipation for an SCR is 0.5 Watts the voltage applied to the gate is Vg = 10 V. What is the maximum value of current Ig for safe operation?**	
	(A)	0.25 A
	(B)	10 A
	(C)	0.05 A
	(D)	0.1 A
Answer	Option C	
Explanation	Vg.Ig = 0.5 W, the power dissipation mustn't exceed the average power dissipation	

33	**For an SCR, the gate-cathode characteristic has a slop of 130. The gate power dissipation is 0.5 watts. Find Ig**	
	(A)	0.62 A
	(B)	620 mA

	(C)	62 mA
	(D)	6.2 mA
Answer	Option C	
Explanation	Vg/Ig = 130.. (Given) Vg.Ig = 0.5 watts.. (Given)	

34	**Use both the given data & find the gate current.he two transistor model of the SCR can obtained by**	
	(A)	bisecting the SCR vertically
	(B)	bisecting the SCR horizontally
	(C)	bisecting the SCRs top two & bottom two layers
	(D)	bisecting the SCRs middle two layers
Answer	Option D	
Explanation	The two transistor model consists of p-n-p and n-p-n transistors, of which the middle n-p layer is common in both the transistors.	

35	**. Latching current for an SCR is 100 mA, DC source of 200 V is also connected from the SCR to the L load. Compute the minimum width of the gate pulse required to turn on the device. Take L = 0.2 H.**	
	(A)	50 µsec
	(B)	100 µsec
	(C)	150 µsec
	(D)	200 µsec
Answer	Option C	
Explanation	For L load, E = L di/dt I = E/L t Therefore, 0.100 = 200t/0.2 T = 100 µsec.	

36	**From the two transistors (T1 & T2) analogy of SCR, the total anode current of SCR is _____ in the equivalent circuit.**	
	(A)	the sum of both the base currents
	(B)	the sum of both the collector current
	(C)	the sum of base current of T1 & collector current of T2
	(D)	the sum of base current of T2 & collector current of T1
Answer	Option C	
Explanation	The sum of both the collector currents of T1 and T2 forms the total anode current of SCR. Refer the model.	

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03 – Turn on and Turn of Methods of Thyristor	**Marks:-14**

Content of Chapter:-

3.1SCR Turn-ON methods: High Voltage thermal triggering, Illumination triggering, dv/dt triggering,
3.2Gate triggering. Gate trigger circuits – Resistance and Resistance-Capacitance circuits.
3.3 SCR triggering using UJT, PUT: Relaxation Oscillator and Synchronized UJT circuit.
3.4 Pulse transformer and opto-coupler based triggering.
3.5 SCR Turn-OFF methods: Class A-Series resonant commutation circuit, Class BShunt
3.6 Resonant commutation circuit, Class C-Complimentary Symmetry commutation circuit, Class D -Auxiliary commutation, Class E- External pulse commutation. Class F- Line or natural commutation

1	**. The thyristor turn-off requires that the anode current**	
	(A)	falls below the holding current
	(B)	falls below the latching current
	(C)	rises above the holding current
	(D)	rises above the latching current
Answer	Option A	
Explanation	For effective turn-off of the SCR the anode current must fall below the holding current value	

2	**In case of class A type commutation or load commutation with low value of R load the**	
	(A)	L is connected across R
	(B)	L-C is connected across R
	(C)	L is connected in series with R
	(D)	L-C is connected in series with R
Answer	Option D	
Explanation	In case of Class A commutation the requirement is that the circuit should be an under-damped RLC circuit	

3	**The class A commutation or load commutation is possible in case of**	
	(A)	dc circuits only
	(B)	ac circuits only
	(C)	both DC and AC circuits
	(D)	none of the above mentioned
Answer	Option A	
Explanation	The nature of the circuit should be such that when energized from the source, current must aa natural tendency to decay to zero for load commutation to occur in a SCR circuit.	

4	**An SCR is connected in series with L = 5 mH and C = 20 µF. Find the resonant frequency of the circuit.**	
	(A)	2569 rad/s

	(B)	3162 rad/s
	(C)	2400 rad/s
	(D)	7889 rad/s
Answer	Option B	
Explanation	ω = 1/√LC	

5	**The type of commutation when the load is commutated by transferring its load current to another incoming thyristor is**	
	(A)	class A or load commutation
	(B)	class B or resonant commutation
	(C)	class C or complementary commutation
	(D)	class D or impulse commutation
Answer	Option C	
Explanation	Explanation: In the Class C type commutation also called as complementary commutation the load is commutated by transferring the current th another device.	

6	**The natural reversal of ac supply voltage commutates the SCR in case of**	
	(A)	forced commutation
	(B)	only line commutation
	(C)	only natural commutation
	(D)	both line & natural commutation
Answer	Option D	
Explanation	Both line and natural commutations are used in converters.	

7	**_____ Commutation technique is commonly employed in series inverters**.	
	(A)	Line
	(B)	load
	(C)	forced
	(D)	external-pulse
Answer	Option B	
Explanation	Load commutation is used in inverter in which L and C are connected in series with the load or C in parallel with the load such that overall load circuit is under damped.	

8	**The GTO can be turned off**	
	(A)	by a positive gate pulse
	(B)	by a negative gate pulse
	(C)	by a negative anode-cathode voltage
	(D)	by removing the gate pulse
Answer	Option B	
Explanation	Explanation: The GTO can be turned off by applying a negative gate pulse to the gate terminal.	

9	**With the anode positive with respect to the cathode & the gate circuit open, the SCR is said to be in the**	
	(A)	reverse blocking mode
	(B)	reverse conduction mode

	(C)	forward blocking mode
	(D)	forward conduction mode
Answer	Option C	
Explanation	The SCR is in the forward blocking mode with its top and bottom junctions forward biased and the middle junction reversed biased	

10	**For an SCR in the forward blocking mode (practically)**	
	(A)	leakage current does not flow
	(B)	leakage current flows from anode to cathode
	(C)	leakage current flows from cathode to anode
	(D)	leakage current flows from gate to anode
Answer	Option A	
Explanation		

11	MOSFET is	
	(A)	Uncontrolled device
	(B)	Current controlled device
	(C)	Voltage controlled device
	(D)	Temperature controlled device
Answer	Option C	

12	SCR is a ---------- trigged device	
	(A)	Voltage
	(B)	Current
	(C)	Voltage and Current
	(D)	None of these
Answer	Option B	

13	Choose the false statement.	
	(A)	SCR is a bidirectional device
	(B)	SCR is a controlled device
	(C)	In SCR the gate is the controlling terminal
	(D)	SCR are used for high – power applications
Answer	Option A	

14	In the SCR structure the gate terminal is located	
	(A)	Near the anode terminal
	(B)	Near the cathode terminal
	(C)	In between the anode & cathode terminal
	(D)	None of these
Answer	Option B	

15	The static V – I curve for the SCR is plotted for.	
	(A)	Ia (anode current) vs Ig (gate current), Va (anode – cathode voltage) as a parameter
	(B)	Ia vs Va with Ig as a parameter
	(C)	Va vs Ig with Ia as a parameter
	(D)	Ig vs Vg with Ia as a parameter
Answer	Option B	

16	For an SCR in the reverse blocking mode, (practically)	
	(A)	Leakage current does not flow
	(B)	Leakage current flows from anode to cathode
	(C)	Leakage current flows from cathode to anode
	(D)	Leakage current flows from gate to anode
Answer	Option C	

17	The forward break over voltage is the	
	(A)	Anode – cathode voltage at which conduction starts with gate signal apply
	(B)	Anode – cathode voltage at which conduction starts with no gate signal applied
	(C)	Gate voltage at which conduction starts with no anode – cathode voltage
	(D)	Gate voltage at which conduction starts with anode – cathode voltage applied
Answer	Option B	

18	For a forward conducting SCR device, as the forward anode to cathode voltage is increased	
	(A)	The device turns on at higher values of gate current
	(B)	The device turns on at lower values of gate current
	(C)	The forward impedance of the device goes on increasing
	(D)	The forward impedance of the device goes on decreasing
Answer	Option B	

19	A thyristor can be bought from the forward conduction mode to forward blocking mode	
	(A)	The dv / dt triggering method
	(B)	Applying a negative gate signal
	(C)	Applying a positive gate signal
	(D)	Applying a reverse voltage across anode – cathode terminals
Answer	Option D	
20	Among the following, the most suitable method to turn on the SCR device is the	
	(A)	Gate triggering method
	(B)	dv / dt triggering method
	(C)	Forward voltage triggering method
	(D)	Temperature triggering method
Answer	Option A	

21	The forward break over voltage is maximum	
	(A)	Gate current = ∞
	(B)	Gate current = 0
	(C)	Gate current = $-\infty$
	(D)	It is independent of gate current
Answer	Option B	

22	The value of anode current required to maintain the conduction of an SCR even though the gate signal is removed is called as the	
	(A)	Holding current
	(B)	Latching current
	(C)	Switching current
	(D)	Peak anode current
Answer	Option B	

23	During the transition time or turn – on time	
	(A)	The forward anode voltage decreases from 90% to 10% & the anode current also decreases from 90 to 10% of the initial value
	(B)	The forward anode voltage increases from 10% to 90% & the anode current also increases from 10% to 90% of the initial value
	(C)	The forward anode voltage decreases from 90% to 10% & the anode current increases from 10% to 90% of the initial value
	(D)	The forward anode voltage increases from 10% to 90% & the anode current decreases from 90% to 10% of the initial value
Answer	Option C	

24	If firing angle in an SCR circuit is increased, the output	
	(A)	Remains same
	(B)	Decreased
	(C)	Increased
	(D)	None of these
Answer	Option B	
25	The forward dv / dt rating of an SCR	
	(A)	Increasing with increase in the junction temperature
	(B)	Decreases with increase in the junction temperature
	(C)	Increases with decrease in the rms value of forward anode – cathode voltage
	(D)	Decreases with decrease in the rms value of forward anode – cathode voltage
Answer	Option A	

26	SCRs are connected in parallel to fulfil the -------- demand	
	(A)	High voltage

	(B)	High current
	(C)	Size
	(D)	Efficiency
Answer	Option B	

27	For a string voltage of 3300 V, let there be six series connected SCRs each of voltage 600 V. Then the string efficiency is	
	(A)	99.36%
	(B)	91.7%
	(C)	98.54%
	(D)	96%
Answer	Option B	

28	The most practical way of obtaining a uniform distribution of series connected SCRs is to	
	(A)	Connect a resistor of value R in series with each of the series connected SCRs
	(B)	Connect a resistor of value R in parallel with each of the series connected SCRs
	(C)	Connect a resistor of value R in series with one of the series connected SCRs
	(D)	Connect a resistor of value R in parallel with one of the series connected SCRs.
Answer	Option C	

29	3 SCRs are connected in series. The string efficiency is 91%. SCRs 1, 2 & 3 have leakage currents 4 mA, 8 mA & 12 mA. Which SCR will block more voltage?	
	(A)	SCR - 1
	(B)	SCR - 2
	(C)	SCR - 3
	(D)	All the three will block equal voltage
Answer	Option B	

30	21 SCRs with a rating of 1000 V & 200 A are available to be used in a string to handle 6 KV & 1 KV. Calculate the number of series & parallel units required in case the de – rating factor is 0.1. (Round off the fraction to the greatest & nearest integer)	
	(A)	Series = 7, Parallel = 6
	(B)	Series = 6, Parallel = 7
	(C)	Series = 6, Parallel = 6
	(D)	All the three will block equal voltage
Answer	Option A	

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04 – Phase Controlled Rectifiers	Marks:-18

Content of Chapter:-

4.1 Phase control: firing angle, conduction angle.

4.2 Single phase half controlled full controlled and midpoint controlled rectifier with R. RL load: Circuit diagram, working, input- output waveforms, equations for DC output and effect of freewheeling diode. Different configurations of bridge controlled rectifiers: Full bridge, half bridge with common anode, common cathode, SCRs in one arm and diodes in another arm.

1	**In the process of diode based rectification, the alternating input voltage is converted into**	
	(A)	an uncontrolled alternating output voltage
	(B)	an uncontrolled direct output voltage
	(C)	a controlled alternating output voltage
	(D)	a controlled direct output voltage
Answer	Option B	
Explanation	Rectification is AC to DC. In DIODE biased rectification, control is not possible	

2	**In a half-wave rectifier, the**	
	(A)	current & voltage both are bi-directional
	(B)	current & voltage both are uni-directional
	(C)	current is always uni-directional but the voltage can be bi-directional or uni-directional
	(D)	current can be bi-directional or uni-directional but the voltage is always uni-directional
Answer	Option C	
Explanation	Current is always in one direction only, but voltage can be bi-directional in case of an L load.	

3	**For a certain diode based rectifier, the output voltage (average value) is given by the equation** $1/2\pi [\int Vm \sin \omega t \, d(\omega t)]$ Where the integral runs from 0 to π The rectifier configuration must be that of a	
	(A)	single phase full wave with R load
	(B)	single phase full wave with RL load
	(C)	single phase half wave with R load
	(D)	single phase half wave with RL load
Answer	Option C	
Explanation	**Integration is 0 to π from base period of 1/2π so it is a half wave R load**.	

4	**For a single phase half wave rectifier, with R load, the diode is reversed biased from ωt =**	
	(A)	0 to π, 2π to 2π/3
	(B)	π to 2π, 2π/3 to 3π
	(C)	π to 2π, 2π to 2π/3
	(D)	0 to π, π to 2π
Answer	Option B	
Explanation	**Diode will be reversed biased in the negative half cycles.**	

5	**The secondary transformer voltage Vs is given by the expression** Vs = Vm sin ωt Find the PIV of the diode.	
	(A)	√2
	(B)	Vs
	(C)	Vm
	(D)	√2 Vm
Answer	Option C	
Explanation	PIV = √2 Vs = Vm.	

6	**In a 1-Phase HW diode rectifier with R load, the average value of load current is given by Take Input (Vs) = Vmsinωt**	
	(A)	Vm/R
	(B)	Vm/2R
	(C)	Vm/πR
	(D)	Zero
Answer	Option C	
Explanation	Vo = √ [(1/2π) ∫π Vmsinωt. d(ωt)] Vo = Vm/π I = Vo/R = Vm/πR.	

7	**The switch (shown in green) is closed at ωt = 0. The load current or capacitor current has the maximum value at ωt =**	
	(A)	0
	(B)	π
	(C)	2π
	(D)	none of the mentioned
Answer	Option A	
Explanation	The instant switch is closed the load current will be zero due to the nature of the capacitor	

8	**A 1-phase 230V, 1KW heater is connected across a 1-phase HW rectifier (diode based). The power delivered to the heater is**	
	(A)	300 W
	(B)	400 W
	(C)	500 W
	(D)	600 W

Answer	Option C
Explanation	R = (230 x 230)/1000 V(rms) = (√2 x 230)/2 P = V(rms)^2/R = 500W.

9	**-phase half wave diode rectifier with R load, has input voltage of 240 V. The input power factor is**	
	(A)	Unity
	(B)	0.707 lag
	(C)	0.56 lag
	(D)	0.865 lag
Answer	Option C	
Explanation	Input p.f = V(rms)/Vs Vrms is the RMS value of output voltage. Vrms = (√2 x 230)/2 Vs = 230 pf = 0.707.	

10	**-phase half wave diode rectifier with R = 1 KΩ has input voltage of 240 V. The diode peak current is**	
	(A)	Zero
	(B)	240mA
	(C)	24mA
	(D)	0.24mA
Answer	Option B	
Explanation	Diode peak current = peak current through the load = Vo/R = Vm/2R.	

11	**Vs = 325 sin ωt (secondary side)** The ripple voltage is	
	(A)	125.32 V
	(B)	255.65 V
	(C)	325 V
	(D)	459.12 V
Answer	Option A	
Explanation	Ripple voltage = √(Vrms^2 + Vavg^2) Vrms = Vm/2 Vavg = Vm/π	

12	**For a single phase half wave rectifier, the rectifier efficiency is always constant & it is**	
	(A)	4/π^2
	(B)	8/π^2
	(C)	100
	(D)	2/π^2
Answer	Option A	
Explanation	Rectifier efficiency = Pdc/Pac Pdc = (Vm x Im)/π^2 Pac = 4/(Vm x Im).	

13	**A single-phase full wave mid-point type diode rectifier requires _____ number of diodes whereas bridge type requires _____**	
	(A)	1,2
	(B)	2,4
	(C)	4,8
	(D)	3,2
Answer	Option A	
Explanation	A bridge type requires 4 diodes which are connected in a bridge, and the mid-point has 2 diodes.	

14	**A single-phase full wave rectifier is a**	
	(A)	single pulse rectifier
	(B)	multiple pulse rectifier
	(C)	two pulse rectifier
	(D)	three pulse rectifier
Answer	Option C	
Explanation	It is a two-pulse rectifier as it generates 2 pulses per cycle	

15	**In a 1-phase full wave bridge rectifier with M-2 type of connection has secondary side voltage Vs = Vm sin ωt, with R load & ideal diodes. The expression for the average value of the output voltage can be given by**	
	(A)	$2Vm/\pi$
	(B)	Vm/π
	(C)	$Vm/\sqrt{2}$
	(D)	$2Vm/\sqrt{2}$
Answer	Option A	
Explanation	The voltage waveform is a pulsating voltage with peak value Vm& symmetrical about π. $Vo = (1/\pi) \int^{\pi} Vm\sin\omega t \, d(\omega t)$	

16	**In a 1-phase full wave bridge rectifier with M-2 type of connection has secondary side voltage Vs = Vm sin ωt, with R load & ideal diodes. The expression for the rms value of the output voltage can be given by**	
	(A)	Vm/π
	(B)	$Vm/\sqrt{2}$
	(C)	Vm
	(D)	Vm^2
Answer	Option B	
Explanation	The voltage waveform is a pulsating voltage with peak value Vm& symmetrical about π. $Vo = (1/\pi) \int^{\pi} Vm^2 \sin^2\omega t \, d(\omega t) = Vm/\sqrt{2}$.	

17	**The PIV experienced by the diodes in the mid-point type configuration is**	
	(A)	Vm
	(B)	2Vm
	(C)	4Vm

	(D)	Vm/2
Answer	Option B	
Explanation	In the m-2 type connection, each diode experiences a reverse voltage of 2Vm	

18	**for a single phase, full bridge, diode rectifier excited from a 230 V, 50 Hz source. With R = 10 Ω & the inductance(L) large enough to maintain continues conduction, the average and rms values of diode currents will be**	
	(A)	7.85 A, 8 A
	(B)	10.35 A, 7.85 A
	(C)	10.35 A, 14.6 A
	(D)	8 A, 8 A
Answer	Option C	
Explanation	Id(avg) = Io/2 = Vo/2R Id(rms) = Io/√2 = Vo/R√2	

19	**For a single phase, full bridge, diode rectifier excited from a 230 V, 50 Hz source. With R = 10 Ω & the inductance(L) large enough to maintain continuous conduction, the value of the supply power factor will be**	
	(A)	0.707 lag
	(B)	0.9 lag
	(C)	0.86 lag
	(D)	Unity
Answer	Option B	
Explanation	Pf = Vs.Is.cosθ/Vo.Io Io = Vo/R A Vo = 2Vm/π Volts	

20	**The rectification efficiency for B-2 type & M-2 type full wave diode rectifiers are ___ & ___ respectively**	
	(A)	8/π & 4/π
	(B)	4/π & 8/π
	(C)	8/π & 8/π
	(D)	4/π & 4/π
Answer	Option C	
Explanation	B-2 type has efficiency 8/π. M-2 type has efficiency half of that of a B-2 type	

21	**A load of R = 60 Ω is fed from 1phase, 230 V, 50 Hz supply through a step-up transformer & than a diode. The transformer turns ratio = 2. The power delivered to the load is**	
	(A)	614 Watts
	(B)	714 Watts
	(C)	814 Watts
	(D)	914 Watts
Answer	Option B	
Explanation	$P = Vo^2/R$ Vo = Vm/π	

	AC supplied to the rectifier is 2 x 230 = 460 V (rms) Therefore, Vo = $\sqrt{2}$ x 460 / π = 207.04 P = 714.43 W.

22	**Assume that anode of D12 is positive at ωt = 0 and likewise.**	
	(A)	0 to π
	(B)	π to 2π
	(C)	2π to 3π
	(D)	0 to π/2
Answer	option B	
Explanation	In the first cycle i.e. 0 to π, D12 and D13 conduct. In the next cycle i.e. π to 2π, D11 and D14 conduct.	

23	21 SCRs with a rating of 1000 V & 200 A are available to be used in a string to handle 6 KV & 1 KV. Calculate the number of series & parallel units required in case the de – rating factor is 0.1. (Round off the fraction to the greatest & nearest integer)	
	(A)	Series = 7, Parallel = 6
	(B)	Series = 6, Parallel = 7
	(C)	Series = 6, Parallel = 6
	(D)	Series = 7, Parallel = 7
Answer	Option A	

24	The average output voltage is maximum when SCR is triggered at	
	(A)	π
	(B)	0
	(C)	$\pi / 2$
	(D)	$\pi / 4$
Answer	Option B	

25	In a single phase half – wave thyristor circuit with R load & Vs = Vm $\sin \omega t$, the maximum value of the load current can be given by	
	(A)	2Vm/R
	(B)	Vs/R
	(C)	Vm/2
	(D)	Vs/2
Answer	Option C	

26	A three – phase, three – pulse, M – 3 type controlled converter uses -------- number of SCRs.	
	(A)	1
	(B)	2
	(C)	3
	(D)	4
Answer	Option C	

27	A three phase full converter will require ------ number of SCRs.	
	(A)	3
	(B)	6
	(C)	9
	(D)	2
Answer	Option B	
28	Choppers convert	
	(A)	AC to DC
	(B)	DC to AC
	(C)	DC to DC
	(D)	AC to AC
Answer	Option	

29	Which device can be used in a chopper circuit?	
	(A)	BJT
	(B)	MOSFET
	(C)	GTO
	(D)	All of the mentioned
Answer	Option C	

30	What is the duty cycle of a chopper?	
	(A)	Ton/Toff
	(B)	Ton/T
	(C)	T/Ton
	(D)	Toff x Ton
Answer	Option B	

31	Inverters converts	
	(A)	dc power to dc power
	(B)	dc power to ac power
	(C)	ac power to dc power
	(D)	ac power to dc power
Answer	Option B	

32	Line – commutated inverters have	
	(A)	AC on the supply side and DC on the load side
	(B)	AC on both supply and load side
	(C)	DC on both supply and load side
	(D)	DC on the supply side and AC on the load side
Answer	Option B	

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05 – Industrial Controlled circuit	**Marks:08**

Content of Chapter:-

5.1 application burglars alarm system , battery charger using scr ,Emergency lighting system temperature controller using scr, illumination control, fan speed control using triac,

5.2 smps circuit using MOSFET ,IGBT and power transistor

5.3 offline and online circuit using mosfet , IGBT and power transistor

5.4 scr mosfet and IGBT based ac and dc circuit breaker

1	**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
Answer	Option A	

2	**Choose the incorrect statement.**	
	(A)	SMPS is less sensitive to input voltage variations
	(B)	SMPS is smaller as compared to rectifiers
	(C)	SMPS has low input ripple
	(D)	SMPS is a source of radio interference
Answer		

3	**Full form of UPS__**	
	(A)	Uninterruptable power supply
	(B)	United power supply
	(C)	Uninterruptible power supply
	(D)	Upper power supply
Answer	Option C	

4	**A power inverter is a combination of ___ and ___.**	
	(A)	Electronic circuitry and mechanical rotating apparatus
	(B)	Power and current source
	(C)	Transformer and electronic circuitry
	(D)	None of the above
Answer	Option B	

5	**The maximum firing angle in the half wave controlled regulator is -**	
	(A)	180 degree
	(B)	190 degree
	(C)	200 degree
	(D)	210 degree
Answer	Option D	

6	**Full form of LED**	
	(A)	Light emitting diode
	(B)	Light activated scr
	(C)	Switched Mode Power Supply
	(D)	Switch mode of Power supply
Answer	Option A	

7	**When the temperature increases, the intrinsic standoff ratio …….**	
	(A)	Increase
	(B)	Decreases
	(C)	Essentially remains the same
	(D)	None of the above
Answer	Option C	

8	**The power demand can be estimated approximately by**	
	(A)	Load survey method
	(B)	Mathematical method.
	(C)	Statistical method.
	(D)	Economic parameters
Answer	Option C	

9	**The Forward Dv/Dt Rating Of An SCR:-**	
	(A)	Decrease with The Decrease in The RMS Value If Forward Anode Cathode Voltage
	(B)	Decrease with the Increase in the Junction Temperature
	(C)	Increase with An Increase in The Junction Temperature
	(D)	Increase With The Decrease In The RMS Value Of Forward Anode Cathode Voltage
Answer	Option B	

10	**Light dimmer circuit is design using**	
	(A)	DIAC
	(B)	TRIAC
	(C)	DIAC & TRIAC
	(D)	None of above

Answer	Option B	

11	**The Function of SCR Contactor in Resistance Welding Machine Is**	
	(A)	To Provide an Accurate Weld Time for Each Weld
	(B)	To Connect the Large Power Supply to Welding by Closing a Small Switch
	(C)	To Provide Full Wave Rectification of the Welding Current
	(D)	To Avoid Saturation of Transformation Core
Answer	Option B	

12	**for a buck converter to reduce the conduction losses in diode**	
	(A)	A high on - resistance switch can be added in parallel
	(B)	A low on - resistance switch can be added in parallel
	(C)	A high on - resistance switch can be added in series
	(D)	A low on - resistance switch can be added in series
Answer	Option B	

13	**The maximum firing angle in the full wave controlled regulator is** -	
	(A)	180 degree
	(B)	190 degree
	(C)	200 degree
	(D)	210 degree
Answer	Option D	

14	**Choose the incorrect statement.**	
	(A)	SMPS is less sensitive to input voltage variations
	(B)	SMPS is smaller as compared to rectifiers
	(C)	SMPS has low input ripple
	(D)	SMPS is a source of radio interference
Answer	Option C	

15	**Two six pulse converters used for bipolar HVDC transmission system, are rated at 1000 MW, +- 200 kV. Find the rms current rating required for the SCRs.**	
	(A)	2500 A
	(B)	1350 A
	(C)	1445 A
	(D)	none of the mentioned
Answer	Option A	

16	**During the commutation period in 3 phase converters, overlap time is -**	
	(A)	Dependent on the load current
	(B)	Dependent on the voltage
	(C)	Dependent on both the load current and load voltage behind the short circuit current

	(D)	Independent on both the load current and load voltage
Answer	Option A	

17	**For An SCR, The Gate-Cathode Characteristics Have a Slope Of 130. The Gate Power Dissipation Is 0.5 Watt. Find Ig.**	
	(A)	6.2 Ma
	(B)	0.62 A
	(C)	620 Ma
	(D)	62 Ma
Answer	Option C	

18	**Two six pulse converters used for bipolar HVDC transmission system, are rated at 1000 MW, +- 200 kV. Find the rms current rating required for the SCRs**	
	(A)	2500 A
	(B)	1350 A
	(C)	1445 A
	(D)	None of the above
Answer	Option A	

19	**For An SCR, The Gate-Cathode Characteristics Have A Slope Of 130. The Gate Power Dissipation Is 0.5 Watt. Find Ig.**	
	(A)	6.2 Ma
	(B)	0.62 A
	(C)	620 Ma
	(D)	62 Ma
Answer	Option C	

20	**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
Answer	Option D	

21	**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
Answer	Option B	

22	**A three - phase bridge inverter requires minimum of -------- switching devices.**	
	(A)	3
	(B)	4
	(C)	6
	(D)	8
Answer	Option	
23	**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
Answer	Option B	

24	**In the 180º mode VSI, ---------- devices conduct at a time**	
	(A)	5
	(B)	2
	(C)	3
	(D)	4
Answer	Option C	

25	**One stage power converter**	
	(A)	One stage power converter
	(B)	One stage voltage converter
	(C)	One stage frequency converter
	(D)	None of the mentioned
Answer	Option C	

26	**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
Answer	Option B	

27	**Static UPS requires ----------**	
	(A)	Only rectifier
	(B)	Only inverter
	(C)	Both inverter and rectifier
	(D)	None of the mentioned
Answer	Option C	

28	**Under harmonic free load voltages, the 3 phase VSI**	
	(A)	Does not contains second harmonic
	(B)	Does not contains third harmonic
	(C)	Does not contains fifth harmonic
	(D)	Does not contains seventh harmonic
Answer	Option A	

29	**The square wave operation of 3 phase VSI lines contains the harmonics. The amplitudes are**	
	(A)	Directly proportional to their harmonic order
	(B)	Inversely proportional to their harmonic order
	(C)	Not related to their harmonic order
	(D)	None of these
Answer	Option B	

30	**In square wave operation mode of 3 phase VSI, the VSI**	
	(A)	Can control the load voltage
	(B)	Cannot control the load voltage
	(C)	Cannot control the load voltage except by means of dc link voltage
	(D)	Cannot control the load voltage except by means of dc link current
Answer	Option C	

31	**In a 3 phase VSI SPWM to use a single carrier signal and preserve the features ofPWM technique, the normalized carrier frequency should be**	
	(A)	Multiple of two
	(B)	Odd multiple of three
	(C)	Odd multiple of five
	(D)	Odd multiple of seven
Answer	Option B	

32	**In three phase voltage source inverters**	
	(A)	Only amplitude of voltage is controllable
	(B)	Only phase is controllable
	(C)	Both amplitude and phase is controllable
	(D)	Amplitude, phase and frequency of voltages should always be controllable
Answer	Option D	

33	**In a 3-phase voltage source inverter used for speed control of induction motor, ant parallel diodes are used across each switching device. The main purpose of is**	
	(A)	Protect the switching devices against overvoltage
	(B)	Provide the path for freewheeling current
	(C)	Allow the motor to return energy during regeneration

	(D)	Help in switching off the devices
Answer	Option C	

34	**The 120° mode of operation of a three phase bridge inverter requires _____number of steps.**	
	(A)	2
	(B)	4
	(C)	6
	(D)	8
Answer	Option C	

35	**In case of the 120° mode of operation, _____ devices conduct at a time.**	
	(A)	2
	(B)	3
	(C)	4
	(D)	none
Answer	Option A	

36	**The peak value of the line voltage in case of 120° mode of operation of a three-phase**	
	(A)	Vs/2
	(B)	3Vs/2
	(C)	Vs/√2
	(D)	Vs
Answer	Option D	

37	**In a three phase voltage source inverters**	
	(A)	Only amplitude of voltage is controllable
	(B)	Only phase is controllable
	(C)	Both amplitude and phase is controllable
	(D)	Amplitude, phase and frequency of voltages should always be controllable
Answer	Option D	

38	**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
Answer	Option B	

39	**Why do we have to use Multilevel Inverter?**	
	(A)	To overcome device rating limitation
	(B)	For higher power application
	(C)	It produces output with less harmonic content
	(D)	All of these

Answer	Option D

40	**Harmonic content of Multilevel Inverter output is _____ the output of Voltage Source Inverter.**	
	(A)	less than
	(B)	zero
	(C)	greater than
	(D)	same as
Answer	Option A	
41	**An 'm' level inverter needs _____ number of capacitors**	
	(A)	1-m
	(B)	m-1
	(C)	1*m
	(D)	m
Answer	Option B	

42	Which of the following is not a type of multilevel inverter?	
	(A)	Diode Clamped Multilevel Inverter
	(B)	Balancing Capacitor Multilevel Inverter
	(C)	DC Bus Capacitor Multilevel Inverter
	(D)	Cascaded H Bridge Multilevel Inverter
Answer	Option C	

43	**No. of controlled semiconductor switches required to construct 5 level DCMLI per pole is**	
	(A)	4
	(B)	8
	(C)	16
	(D)	32
Answer	Option B	

44	**No. of main diodes is required to construct 5 Level DCMLI to produce the complete cycle waveform**	
	(A)	4
	(B)	6
	(C)	8
	(D)	16
Answer	Option D	

45	**For k level Diode Clamped Multilevel Inverter, the number of capacitors required is _____ (k is the number of levels)**	
	(A)	k x 2
	(B)	1 - k
	(C)	k - 1
	(D)	1 / k

Answer	Option A

46	**With How many minimum clamping diodes per pole we can construct 5 level DCMLI?**	
	(A)	4
	(B)	6
	(C)	12
	(D)	18
Answer	Option B	

47	**In the operation of 5 level DCMLI, how many times the switch is turned on per Cycle**	
	(A)	1
	(B)	2
	(C)	3
	(D)	4
Answer	Option A	

48	**In inverters, to make the supply voltage constant**	
	(A)	an inductor is placed in series with the load
	(B)	capacitor is connected in parallel to the load side
	(C)	capacitor is connected in parallel to the supply side
	(D)	none of the mentioned
Answer	Option C	

49	**The external control of ac output voltage can be achieved in an inverter by**	
	(A)	connecting a cyclo-converter
	(B)	connecting an ac voltage controller between the output of the inverter and load
	(C)	connecting an ac voltage controller between the dc source and inverter
	(D)	connecting an ac voltage controller between the load and the dc source
Answer	Option B	

50	**The series-inverter control method is a/an**	
	(A)	internal voltage control method
	(B)	external frequency control method
	(C)	external voltage control method
	(D)	none of the mentioned
Answer	Option C	

51	**External control of dc input voltage can be obtained by the use of a**	
	(A)	transformer
	(B)	chopper
	(C)	inverter
	(D)	converter
Answer	Option B	

52	**Method is an internal method for controlling the inverter output voltage.**	
	(A)	series connection of inverters
	(B)	chopper method
	(C)	commutating capacitor
	(D)	pulse width modulation
Answer	Option D	

53	**In the PWM method**	
	(A)	external commutating capacitors are required
	(B)	more average output voltage can be obtained
	(C)	lower order harmonics are minimized
	(D)	higher order harmonics are minimized
Answer	Option C	
54	**Which of the following is not a PWM technique?**	
	(A)	Single-pulse width modulation
	(B)	Multiple-pulse width modulation
	(C)	Triangular-pulse width modulation
	(D)	Sinusoidal-pulse width modulation
Answer	Option C	

55	**The shape of the output voltage waveform in a single PWM is**	
	(A)	square wave
	(B)	triangular wave
	(C)	quasi-square wave
	(D)	sine wave
Answer	Option C	

56	**In case of a single-pulse width modulation with the pulse width = 2d, to eliminate the nth harmonic from the output voltage**	
	(A)	$d = \pi$
	(B)	$2d = \pi$
	(C)	$nd = \pi$
	(D)	$nd = 2\pi$
Answer	Option C	

57	**Several equidistant pulses per half cycle are used in _____ type of modulation technique.**	
	(A)	single-pulse
	(B)	multiple-pulse
	(C)	sine-pulse
	(D)	equidistant-pulse
Answer	Option B	

58	**In _____ type of modulation method, the pulse width is not equal for all the Pulses**

	(A)	multiple pulse width modulation
	(B)	single pulse width modulation
	(C)	sinusoidal pulse width modulation
	(D)	none of the mentioned
Answer	Option C	

59	**In PWM, the comparator output is further given to a _____**	
	(A)	integrator
	(B)	scr devices
	(C)	trigger pulse generator
	(D)	snubber circuit
Answer	Option C	

60	**In pulse width modulated inverters, the output voltage is controlled by controlling the**	
	(A)	input frequency
	(B)	modulating index
	(C)	amplification factor
	(D)	none of the mentioned
Answer	Option B	

61	**A CSI converts**	
	(A)	the input dc current to an an current at output
	(B)	the input ac current to dc current at output
	(C)	the input dc current to amplified dc current at the output
	(D)	the input ac current to amplified ac current at the output
Answer	Option D	

62	**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.
Answer	Option A	

63	**Force-commutated CSIs need**	
	(A)	capacitors for their commutation
	(B)	inductors for their commutation
	(C)	diodes for their commutation
	(D)	none of the mentioned
Answer	Option A	

64	**Which of the following is used as a harmonic reduction technique in inverters?**	
	(A)	Amplitude modulation
	(B)	Cycloconverter control
	(C)	Transformer connection
	(D)	Series connection of two inverters
Answer	Option C	

65	**In a full bridge VSI, in order to avoid the short circuit across the DC bus and the undefined AC output voltage condition, the modulating technique should ensure that**	
	(A)	Top switch of each leg is on at any instant
	(B)	Bottom switch of each leg is on at any instant
	(C)	Either (a) or (b)
	(D)	None of these
Answer	Option C	

66	**The output current wave of a single-phase full bridge inverter on RL load is**	
	(A)	a sine wave
	(B)	a square wave
	(C)	a triangular wave
	(D)	constant dc
Answer	Option	

67	**The total harmonic distortion (THD) is the measure of**	
	(A)	input vs output power factor
	(B)	temperature sensitivity
	(C)	waveform distortion
	(D)	contribution of each harmonic to the total output
Answer	Option C	

68	**A single-phase full bridge VSI has inductor L as the load. For a constant source voltage, the current through the inductor is**	
	(A)	square wave
	(B)	triangular wave
	(C)	sine wave
	(D)	pulsed wave
Answer	Option B	

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