GURU NANAK INSTITUTE OF TECHNOLOGY
An Autonomous Institute under MAKAUT
2021
POWER ELECTRONICS (Backlog)
EE603

TIME ALLOTTED: 3HR **FULL MARKS:70**

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable

GROUP – A
(Multiple Choice Type Questions)

Answer any ***ten*** from the following, choosing the correct alternative of each question: **10×1=10**

			Marks	CO No.
1.	(i)	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, single junction device	1	CO1
	(ii)	Choppers converts a) AC to DC b) DC to AC c) DC to DC d) AC to AC	1	CO3
	(iii)	The latching current is _____ than the holding current a)lower b)higher c)same as d) negative of	1	CO1
	(iv)	Applications of cycloconverters include a) speed control of ac drives b) induction heating c) static VAr compensation d) all of the mentioned	1	C05
	(v)	In case of TRC (Time Ratio Control), _____ is varied a) duty cycle b) firing angle c) supply frequency d) supply voltage magnitude	1	CO4
	(vi)	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	1	CO2

(vii)	The forward dv/dt rating of an SCR a) increases 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	1	CO1
(viii)	What is the duty cycle of a chopper ? a) Ton/Toff b) Ton/T c) T/Ton d) Toff x Ton	1	CO3
(ix)	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.	1	CO2
(x)	What causes circulating current in dual converters? a) Temperature issues b) Inductance in load circuit c) Out of phase voltages from both the converters d) none of the mentioned	1	CO2
(xi)	In case of the 120° mode of operation, _____ devices conduct at a time. a) 2 b) 3 c) 4 d) none of the mentioned	1	CO3
(xii)	For a single phase half wave rectifier, with R load, the diode is reversed biased from ωt = a) 0 to π, 2π to $2\pi/3$ b) π to 2π, $2\pi/3$ to 3π c) π to 2π, 2π to $2\pi/3$ d) 0 to π, π to 2π	1	CO2

GROUP – B
(Short Answer Type Questions)

(Answer any *three* of the following) **3 x 5 = 15**

		Marks	**CO No.**
2.	Draw neatly the circuit diagram of four quadrant chopper & explain its operation.	5	CO3
3.	What is current source inverter? Mention its merits & Demerits compared to voltage source inverter	5	CO2
4.	Draw the static VI characteristics of a SCR and explain.	5	CO1
5.	Explain the operation of single phase step-up cycloconverter	5	CO5
6.	For a 3-phase full converter, sketch the time variations of input voltage & the voltage across one thyristor for one complete cycle for a firing angle delay of 30^o	5	CO4

GROUP – C
(Long Answer Type Questions)

(Answer any *three* of the following) **3 x 15 = 45**

		Marks	CO No.
7.a.	Explain the operation of Step-down chopper.	4	CO3
b.	For type-A chopper , dc source voltage =230v chopping frequency, f=500Hz, Ton= 800μs , R= 1ohm, L= 1mH, E= 72V. a) Find wheather load current is continous or not? b) Calculate the values of average output voltage and average output current c) Calculate the maximum and minimum values of steady state output current	6	CO4
c.	Compare in-phase operation mode & phase shifted operation mode of multiphase chopper	5	CO3
8.a.	Obtain an expression for average dc output voltage of a 1-phase fully controlled rectifier for R load with firing angle, α	5	CO2
b.	With the help of schematic diagram & relevant waveforms, explain the operation of three phase to single phase cycloconverter.	5	CO2
c.	Explain the working of three-phase half wave uncontrolled rectifier with relevant wave forms for 'R' load.	5	CO2
9.a.	Illustrate the generation of sine pulse width modulated control signals for a single phase VSI with output voltage waveform.	5	CO4
b.	Explain the performance parameters of inverter	5	CO2
c.	Compare between current source inverter & voltage source inverter.	5	CO2
10.a.	What is the necessity of base drive control in power transistor? Explain proportional base control.	5	CO1
b.	For Class-A commutation, thyristor gets turned at t=0. Determine (a) conduction time of thyristor ,(b) voltage across thyristor and capacitor after SCR is turned off. Calculate these values for L=5Mh & C = 20 μF and Vs= 200 V.	5	CO1
c.	Give the comparison between MOSFET & IGBT.	5	CO1
11.	Write Short Notes (Any three)	3x5=15	
a.	Unijunction Transistor(UJT)	5	CO1
b.	Three phase AC controller	5	CO5
c.	Speed Control of AC motors with Power Electronic Devices	5	CO5
d.	Pulse width modulated(PWM) inverters	5	CO2
e.	Parallel operation of SCRs	5	CO1