

END SEMESTER/ RETEST EXAMINATION, 2020**Semester: 5th****Subject code: CAI-504.****Subject: Power Electronics.****Full Marks: 70 (Part A : 25 + Part B:45)****Duration: 3 hours****Instructions:**

1. Questions on Part A are compulsory
2. Answer any five questions from Part B

PART-A		
MARK-25		
Questions no.		marks
Question 1	Match the following:	1x10=10
	a. UJT	i. Two terminal device
	b. MOSFET	ii. AC Control applications
	c. DIAC	iii. Fast Switching
	d. SCR	iv. DC-AC converter
	e. IGBT	v. AC-AC converter
	f. Triac	vi. Holding Current
	g. Chopper	vii. Rectifier
	h. Diode	viii. DC-DC Converter
	i. Cycloconverter	ix. Threshold voltage



	j. Inverter	x. Relaxation Oscillator	
Question no.2	Write true or false:		1x10=10
	i) IGBT has the characteristics of both BJT and MOSFET		
	ii) A BJT has three junctions		
	iii) MOSFET is a controlled device.		
	iv) The terminals of a BJT are drain, source and gate.		
	v) The most suitable method for SCR triggering is forward voltage triggering		
	vi) A SCR is a p-n-p-n semiconductor switching device.		
	vii) Holding current in SCR is related to SCR turn on operation.		
	viii) A Triac is an unidirectional device.		
	ix) Snubber circuits are used for protection of SCR.		
	x) GTO has two terminals.		
Question no. 3	Fill in the blanks		1x5=5
	i) MOSFET is a _____ controlled device.		
	ii) A SCR has _____ junctions.		
	iii) A triac is equivalent to two _____ connected in antiparallel.		
	iv) A device which converts input power at one frequency to output power at a different frequency is called a _____		
	v) A SCR has _____ modes of operation.		



PART-B, MARK- 45		
Questions no.	Questions	marks
Question no. 4		
Q4a	What is the difference between a general device and power device? What is reverse recovery in power diode?	3
Q4b	Draw the structural diagram of Power MOSFET and describe its basic principle of operation.	6
Question no. 5		
Q5a	Draw the I-V characteristics of SCR and describe the different modes of operation.	5
Q5b	How a SCR can be protected against high dv/dt ? Explain with a suitable circuit diagram	4
Question no.6		
Q6a	Draw the circuit diagram of a SCR firing circuit and describe its working using suitable voltage waveforms.	5
Q6b	A single phase half wave rectifier is operated from a 220V, 50 Hz source and it is used to control a load of Resistance, $R=50\Omega$. For a firing angle delay of 45° , determine the average value and RMS value of load voltage in each case.	4
Question no.7	Draw the voltage waveforms of the following circuits and determine the expression for average value and RMS value of load voltages. i. Single phase half wave rectifier with RL load and freewheeling diode. ii. Single phase full wave rectifier with RL load.	9
Question no. 8	How choppers are classified? Describe one quadrant and two quadrant operations of choppers using circuit diagrams and relevant waveforms.	9



Question no. 9		
Q9a	Explain the working of a single phase inverter circuit with relevant waveforms and mathematical expressions.	6
Q9b	Draw the circuit diagram for the following: i. Single phase to single phase step up cycloconverter. ii. Single phase to single phase step down cycloconverter.	3
Question no. 10	Describe the working of a three phase half wave rectifier with resistive load and determine the expression for average value of load voltage for the following cases: i. $\alpha < \pi/6$ ii. $\alpha > \pi/6$	9
Question no. Q11	Describe the following applications of SCR using circuit diagrams. i. Battery Charger. ii. D.C. Motor Control	9
Question no. Q12	Write short notes on the following	9
	i. Equalizing circuits in SCR. ii. Applications of TRIAC	

