Seat No.:	Enrolment No.
Scat 110	

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-VI (NEW) - EXAMINATION - SUMMER 2017

Subject Code: 2160902 Date: 03/05/2017

Subject Name: Power Electronics – II

Time: 10:30 AM to 01:00 PM Total Marks: 70

Instructions:

- 1. Attempt all questions.
- 2. Make suitable assumptions wherever necessary.
- 3. Figures to the right indicate full marks.

			MARKS
Q.1		Short Questions	14
	1	Define inverter.	1
	2	What should be pulse width in single pulse modulation of PWM inverter to eliminate third harmonic?	1
	3	If amplitude ratio of carrier to modulation signal is 4, What is modulation index?	1
	4	The amplitude of phase voltage in 120^{0} conduction scheme is Vdc.(1/2, 2/3)	1
	5	AC voltage controller can vary but cannot vary (frequency, voltage magnitude)	1
	6	If power factor angle is greater than firing angle, can AC voltage controller control the output power? (Yes, No)	1
	7	How much percentage of more output obtained by SVPWM technique over sine PWM technique?	1
	8	Write down equation for average value of output voltage for half wave AC voltage controller.	1
	9	Give the name of commutation technique used in AC voltage controller.	1
	10	How many thyristors are required in three phase to three phase three pulse cycloconverter?	1
	11	Mention any two applications of cycloconverter.	1
	12	Why voltage to frequency ratio kept constant in I.M. drive.	1
	13	What is derating of machine?	1
	14	Give comparison of AC voltage controller, Inverter and Cycloconverter with reference to input given and output obtained from this device.	1
Q.2	(a)	•	03
	(b)	A three phase bridge inverter delivers power to a resistive load from 450 V d.c. source. For a star connected load of 10 Ω per phase, find rms value of load current for both (a) 180° and (2) 120° mode.	04
	(c)	Explain operation of single phase bridge inverter with RLC underdamped load. Draw waveform of output voltage and current for R, RL, RLC over damped and RLC under damped load. OR	07
	(c)	Discuss 3-phase 180 ⁰ mode VSI. Draw waveform of any two phase voltage and any one line voltage for Y connected resistive load.	07

Q.3	(a) (b)	Sketch unipolar and bipolar PWM technique. For sine PWM technique with ratio fc/fr=15, deduce the harmonic	03 04		
	(D)	spectrum.	04		
	(c)	Discuss SVPWM technique in brief.	07		
	OR				
Q.3	(a)	Discuss requirement of gating circuits.	03		
	(b)	Draw circuit diagram and explain operation in brief of 1-phase Auto Sequential Commutated Inverter with inductive load.	04		
	(c)	Explain concept of selective harmonic elimination technique. Write equations using which third and fifth harmonics can be eliminated from the inverter output voltage.	07		
Q.4	(a)	Explain concept of phase control strategy for regulating the power flow in ac voltage controllers.	03		
	(b)	A single phase full wave ac voltage controller feeds a load of $R=20 \Omega$ with an input voltage of 230 V, 50 Hz. Firing angle of both thyristors is 45° . Calculate (a) rms value of output voltage (b) load power.	04		
	(c)	With neat circuit diagram and waveform explain single phase voltage controller with RL load.	07		
		OR			
Q.4	(a)	Explain concept of integral cycle control strategy for regulating the power	03		
	(1.)	flow in ac voltage controllers.	0.4		
	(b)	A single phase voltage controller is employed for controlling the power flow from 230 V, 50 Hz source into a load circuit consisting or R=3 Ω and wL= 4 Ω . Calculate (a) the control range of firing angle (b) the maximum value of rms load current and (c) the maximum power.	04		
	(c)	Draw different possible configuration of ac voltage controller. Explain basic principle of matrix converter.	07		
Q.5	(a)	Discuss effect of harmonics on machine performance.	03		
	(b)	Discuss self-controlled synchronous motor drive employing load commutated inverter.	04		
	(c)	Draw torque-speed characteristics of induction motor. Discuss motoring and breaking region with necessary equations.	07		
0.5	(o)	OR Draw circuit diagram of static Kramer drive. How slip power can be	03		
Q.5	(a)	recovered using this circuit?			
		Discuss self-controlled synchronous motor drive employing cycloconverter.	04		
	(c)	Discuss closed loop V/f technique used for induction motor drive.	07		
