Seat No.: _____ *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – I • EXAMINATION – WINTER • 2013

Subject code: 712902N **Date: 26-12-2013**

Subject Name: Power Processing Circuits

Time: 10.30 am – 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.**

Q.1	**(a)**	Explain the operation of thyristor with the use of two transistor analogy.	**07**
	(b)	Write a short note: P- Channel MOSFET.	**07**
Q.2	**(a)**	Explain the operation of dual converter with circulating current mode.	**07**
	(b)	Discuss the operation of 1-phase full wave controlled rectifier with source inductance. Draw circuit diagrams & necessary waveforms for the same.	**07**
		OR	
	(b)	With the use of circuit diagram & necessary waveforms, explain the operation of 3- phase full wave controlled converter with $\alpha = 30^o$.	**07**
Q.3	**(a)**	Derive the equation for duty cycle in terms of supply voltage & load voltage for cuk converter with necessary diagrams & waveforms.	**07**
	(b)	Explain the operation of UJT relaxation oscillator.	**07**
		OR	
Q.3	**(a)**	The buck-boost regulator has following parameters: Input voltage = 12V, Duty cycle = 0.25, Switching frequency = 25kHz, L = 150μH, C = 220μF, Average load current = 1.25A. Calculate (1) Average output voltage, (2) Peak to peak o/p voltage ripple, (3) Peak to peak ripple current of inductor, (4) Peak current of the transistor and (5) Critical values of L & C.	**07**
	(b)	Explain operation of push-pull converter.	**07**
Q.4	**(a)**	A 1-phase fully controlled bridge converter supplies an inductive load. Assuming that the output current is virtually constant and is equal to I_d=10A. If supply voltages = 230V & firing angle = 30°, then determine (1) Average O/P voltage, (2) Supply RMS current, (3) Supply fundamental RMS current, (4) Fundamental power factor, (5) Supply power factor, (6) Supply harmonic factor and (7) Voltage ripple factor.	**07**
	(b)	Give comparison between current source inverter and voltage source inverter.	**07**
		OR	
Q.4	**(a)**	Explain the operation of 3-Phase full bridge inverter with 180^0 conduction mode. Draw the waveforms for Pole voltage, Phase voltages & Line voltages.	**07**
	(b)	A single phase bridge inverter has a resistive load of 2.4 Ω & DC input voltage of 48 V. Determine (1) RMS o/p voltage at fundamental frequency, (2) O/P power, (3) Average & peak current of transistor, (4) PIV of transistor, (5) %THD and (6) %DF.	**07**
Q.5	**(a)**	Enlist the types of 1-phase cycloconverter on the basis of its control strategy. Explain any one with neat circuit diagram and waveform.	**07**
	(b)	Explain class C commutation of SCR with necessary waveforms.	**07**
		OR	
Q.5	**(a)**	Describe half bridge dc-dc converter. Compare it with full bridge dc-dc converter.	**07**
	(b)	Explain selective harmonic elimination technique for single pulse width modulated inverter output voltage. Derive necessary expression.	**07**

****