Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Sem-I Examination January 2010

Subject code: 710702 **Subject Name: Advanced Power Electronics**

Date:22 / 01 / 2010 **Time: 12.00 – 2.30pm**

Total Marks: 60

Instructions:

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

Q.1	**(a)**	Draw & explain discontinuous conduction mode characteristic of Buck converter for constant Vd & constant Vo.	**06**
	(b)	A three phase inverter has six step output voltage for star connected balanced R-L load with R = 10Ω and L = 30mH. Inverter is operated at 50 Hz with 180^0 conduction mode scheme supplied with 300 V. Find output phase voltage, current, power delivered to the load, harmonic factor & distortion factor.	**06**
Q.2	**(a)**	Explain switching characteristic of IGBT with current & voltage waveforms.	**06**
	(b)	Explain commonly used techniques for optimizing the base drive of a transistor.	**06**
		OR	
	(b)	Explain with equations steps involved in designing a transformer of Flyback converter.	**06**
Q.3	**(a)**	Draw the circuit diagram of Cuk converter & explain working with waveforms.	**06**
	(b)	Define switch utilization factor. Explain relation of this factor with duty cycle for various dc to dc converters.	**06**
		OR	
Q.3	**(a)**	Draw & explain flyback converter with waveforms.	**06**
	(b)	Derive the expression for peak output inductor current & maximum collector voltages across switch in forward converter.	**06**
Q.4	**(a)**	Explain in detail (i) Phase displacement control (ii) Delta modulation.	**06**
	(b)	Explain working of three phase inverter in 120^0 conduction mode.	**06**
		OR	
Q.4	**(a)**	Explain in detail (i) Space vector modulation (ii) Current source inverter.	**06**
	(b)	What is Harmonic? Explain various harmonic reduction technique used in inverter.	**06**
Q.5	**(a)**	For three phase full wave A.C. controller, draw the following wave forms for $\alpha = 60^0$ & $\alpha = 120^0$ Input line voltage, Input phase voltage, Gate pulse for each thyristor, Output phase voltage.	**06**
	(b)	Explain three phase bidirectional delta connected controller with wave form of gate pulse & line current for $\alpha = 120^0$.	**06**
		OR	
Q.5	**(a)**	Derive the expression for output voltage in three phase to single phase cycloconverter & explain relation between average output voltage & firing angle α.	**06**
	(b)	Classify A.C. voltage controller & explain principle of ON-OFF control & Phase angle control.	**06**

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