Seat No.: _____ *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – I • EXAMINATION – WINTER • 2014

Subject code: 710702N **Date: 02-12-2014**

Subject Name: Advanced Power Electronics

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)**	Compare Power MOSFET, IGBT and SCR with respect to their construction, ratings available, switching characteristics, switching speeds, applications etc.	**07**
	(b)	Draw the circuit diagram of boost converter and explain the continuous conduction mode of operation with necessary waveform and equation.	**07**
Q.2	**(a)**	With neat circuit diagram and waveforms, explain the working of forward converter. Derive output voltage in terms of duty ratio.	**07**
	(b)	Draw circuit diagram of cuk converter and explain its working with waveform and equations.	**07**
		OR	
	(b)	Describe the necessity of Isolation of gate and base drives and explain how they are implemented using the pulse transformer and optoisolator with necessary circuit diagrams.	**07**
Q.3	**(a)**	Explain the working of three phase bridge inverter in 150° conduction mode with necessary waveforms.	**07**
	(b)	Explain various harmonic reduction techniques used in inverter.	**07**
		OR	
Q.3	**(a)**	Explain space vector control of 3-phase bridge inverter. Show that the amplitude of output voltage with space vector technique is 15.5 % higher than that obtained with sine-triangle PWM technique.	**07**
	(b)	Explain unipolar modulation in relation to inverter operation. How is it different from bi-polar modulation? What is the effect of these two schemes on the output voltage's harmonic spectrum?	**07**
Q.4	**(a)**	Explain the working of three-phase current source inverter with neat diagram and necessary waveforms. Compare it with voltage source inverter.	**07**
	(b)	Explain three phase bidirectional delta connected controller with wave form of gate pulse & line current for $\alpha = 120^0$.	**07**
		OR	
Q.4	**(a)**	Classify A.C. voltage controller & explain principle of ON-OFF control & Phase angle control.	**07**
	(b)	Explain the working of three phase full wave A.C. controller for $\alpha = 60^0$ with the wave forms of Input line voltage, Input phase voltage, Gate pulse for each Thyristor and Output phase voltage.	**07**
Q.5	**(a)**	Describe the high frequency transformer design for fly back converter with it's topology and waveforms.	**07**
	(b)	Write a brief note on the design criteria to be considered in the design of SMPS.	**07**
		OR	

Q.5	**(a)**	How design of magnetic components used in power electronic circuit is different than when used in normal electric circuits? Explain 'Area of Product' method in brief.	**07**
	(b)	Explain the operation of three-phase to single phase cycloconverter with neat diagram and necessary waveform. Derive the expression of output voltage.	**07**

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