Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E. SEMESTER I (old course)–EXAMINATION (Remedial) – WINTER 2015

Subject code: 710702 **Date: 09/12/2015**

Subject Name: **Advanced Power Electronics**

Time: 10:30 AM to 1:00 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)**	Draw & explain switching characteristics of MOSFET. Compare MOSFET with Power BJT.	**07**
	(b)	Explain the working of MCT with its equivalent circuit. List Advantages & Applications of MCT.	**07**
Q.2	**(a)**	Explain the Space Vector Pulse Width Modulation in brief.	**07**
	(b)	Derive the expression for rms output voltage, average output voltage, rms thyristor current & average thyristor current for single phase bidirectional controller with R Load.	**07**
		OR	
	(b)	Derive the output voltage equation for three phase to single phase cycloconverter.	**07**
Q.3	**(a)**	Define Harmonics. Discuss in brief various Harmonic reduction techniques.	**07**
	(b)	An on off ac voltage controller has a resistive load of R= 5 Ý & the input voltage is Vs = 120 V (rms), 60 Hz. The thyristor switch is on for n = 125 cycles & is off for m = 75 cycles. Determine (a) the rms output voltage Vo; (b) the input power factor; (c) the average & rms thyristor currents.	**07**
		OR	
Q.3	**(a)**	Differentiate the 120^0 & 180^0 mode of inverter operation.	**07**
	(b)	In a boost converter, the duty ratio is adjusted to regulate the output voltage Vo at 48 V. The input voltage varies in a wide range from 12 to 36 V. The maximum power output is 120 W. For stability reasons, it is required that the converter always operate in a discontinuous current conduction mode. The switching frequency is 50 kHz. Assuming ideal components and C as very large, Calculate the maximum value of L that can be used.	**07**
Q.4	**(a)**	Compare the isolated dc-dc converter topologies.	**07**
	(b)	Discuss the operation of push-pull converter with necessary waveforms.	**07**
		OR	
Q.4	**(a)**	Explain the operation of Cuk converter with waveforms.	**07**
Q.4	**(b)**	Describe the turn on & turn off characteristics of GTO.	**07**
Q.5	**(a)**	Describe the steps for the design of the transformer of forward converter with equations.	**07**
	(b)	Draw the waveforms of 3 phase full wave controllers for Ŭ= 60^0.	**07**
		OR	
Q.5	**(a)**	Explain the commonly used techniques for optimizing the base drive of a transistor.	**07**
	(b)	A three phase, three wire bidirectional controller supplies a star connected resistive load of R = 5Ý and the line to line input voltage is 210 V (rms) 50 Hz. The firing angle is Ŭ= ´ / 3. Determine: (i) the RMS output voltage, E_0. (ii) The input power factor.	**07**

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