Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME - SEMESTER– II (Old course)• REMEDIAL EXAMINATION – SUMMER 2015

Subject Code: Power Electronics – 2 **Date:13/05/2015**

Subject Name: Object Oriented Programming

Time: 02:30 pm to 5:00 pm **Total Marks: 70**

Instructions:

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

Instructions:

4. **Attempt all the questions.**
5. **Make suitable assumptions wherever necessary.**
6. **Notations and symbols used have usual technical meaning.**

Q.1 **(a)** Explain ZVS resonant converter with neat diagram and waveforms. **07**

(b) Neatly draw the output voltage (Vo) waveform of a 1-phase inverter from the description given below. Determine only %THD of the output voltage waveform with the help of $Vo_{(RMS)}$. **07**

Positive half-cycle of output voltage (Vo) waveform:

θ (degree)	0	18	18	162	162	180
Vo (volt)	0	0	10	10	0	0

Negative half-cycle of output voltage (Vo) waveform:

θ (degree)	180	198	198	342	342	360
Vo (volt)	0	0	-10	-10	0	0

Q.2 **(a)** Explain SEPIC converter and its operating modes with neat diagrams. What are the applications and drawbacks of SEPIC? Comment on the factors affecting the reliability and efficiency of SEPIC. **07**

(b) Explain 1-phase boost converter based active PFC with neat diagram and waveforms. **07**

OR

(b) (i) What is Displacement Power Factor (DPF)? Obtain the relationship between PF/DPF and %THD. **05**

(ii) What is the importance of reactive power? **02**

Q.3 **(a)** (i) Compare conventional PWM inverter and resonant pulse inverter. **04**

(ii) Explain the frequency response of a series resonance inverter. **03**

(b) Neatly draw the circuit diagram of Class-E inverter operating at resonance. Various parameters are Vs = 18V, R = 10Ω and switching frequency fs = 50kHz. Determine the optimum values of input inductor, input capacitor, resonance inductor and resonance capacitor. **07**

OR

Q.3 **(a)** Explain resonant DC-link inverter with neat diagram and waveforms. **07**

(b) An L-type ZCS resonant converter delivers a maximum power of P_L = 1kW at Vo = 5V. Supply voltage Vs = 15V. Maximum operating frequency is f_{max} = 40kHz. Determine the values of input inductor and input capacitor. Assume that the intervals t_1 and t_3 are very small and x = **07**

Im/Io = 1.5.

Q.4	**(a)**	Briefly explain the features of capacitor clamped multilevel inverter.	**07**
	(b)	Explain the use of 1-phase PFCs for 3-phase applications.	**07**

OR

Q.4	**(a)**	Explain improved diode clamped 5-level inverter with neat circuit diagram.	**07**
	(b)	A 1-phase power electronic system with diode-bridge rectifier as front-end draws distorted current. Assume utility voltage as sinusoidal. Derive the RMS value of distorted current in terms of %THD. Represent various current components (which are used in the derivation) in form of waveforms.	**07**

Q.5	**(a)**	Explain 3-phase to 3-phase matrix converter.	**07**
	(b)	Briefly explain the steps for designing a high frequency transformer.	**07**

OR

Q.5	**(a)**	Explain 1-phase buck-boost converter based active PFC with neat diagram and waveforms.	**07**
	(b)	Explain 12-pulse converter with neat diagram and waveforms.	**07**

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