Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

ME - SEMESTER–IV • EXAMINATION– WINTER • 2015

Subject Code: 740701 **Date: 05/12/2015**

Subject Name: Harmonic Measurement & Filtration Techniques

Time: 2:30 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.**
4. **Draw well labeled figure, if required.**

Q.1	**(a)**	Define following terms: **(a**) Total Harmonic Distortion (THD) **(b)** Total Demand Distortion (TDD). **(c)**Telephone influence factor (TIF)	**07**
	(b)	How Non-Linear loads are responsible for generation of harmonics? List various types of Non-Linear loads.	**07**
Q.2	**(a)**	Give types of passive filters and explain each briefly. Discuss various aspects to be considered in the design of passive filters.	**07**
	(b)	Discuss all possible condition in which harmonics are generated in Transformer. Also state the effect of harmonics on the performance of transformer.	**07**
		OR	
	(b)	Which types of harmonics are generated in Line Commutated converters? How the harmonics are filtered out in line commutated converters?	**07**
Q.3	**(a)**	Explain the procedure to be carried out to perform harmonic measurement of voltage & current.	**07**
	(b)	Giving schematic diagram, explain the working of positive sequence voltage detector circuit. Also explain functional block diagram of PLL circuit. Why positive sequence voltage detector circuit is so important in shunt active filter design?	**07**
		OR	
Q.3	**(a)**	Discuss harmonic distortion limits for voltage and currents : (i) In agreement with IEEE 519:1992. (II) In conformance with IEC limits.	**07**
	(b)	Explain working of shunt active filter for constant power compensation. Draw the block diagram for constant instantaneous power control strategy and explain its working.	**07**
Q.4	**(a)**	Giving schematic diagram, explain how active filters can be controlled by digital controller based on microprocessor / microcontroller? Also explain operating principles of PLL and PWM units.	**07**
	(b)	Giving circuit diagram, explain the working of series active filters. Also discuss the algorithm used to generate compensated voltage signals.	**07**

OR

Q.4	**(a)**	Showing block diagram, explain the working of first generation control circuit for active series filter.	**07**
	(b)	Compare Passive filters with Active filters.	**07**
Q.5	**(a)**	Draw the block diagram of 3-phase, 3 wire shunt active filter and explain its four functional control blocks.	**07**
	(b)	Explain how following methods helps to reduce harmonics in power systems: (1) Network reconfigurations. (2) Increase of short circuit ratio and (3).Series reactors.	**07**

OR

Q.5	**(a)**	Draw block diagram of shunt active filter for current minimization. Also explain, how generalized Fryze current compensation algorithm is implemented in the filter.	**07**
	(b)	Explain methodology to be adopted to design tuned power filters for harmonics. How filter capacitors are useful for reactive power compensation?	**07**

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