Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME – SEMESTER IV (OLD) – • EXAMINATION – SUMMER 2016

Subject Code: 740701 **Date:04/05/2016**

Subject Name: Harmonics Measurements & Filtration Techniques

Time:10:30 am to 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)**	Define following terms: 1. Total Harmonic Distortion (THD) 2. Total Demand Distortion (TDD) 3. Telephone influence factor (TIF)	**07**
	(b)	Enlist the difference between linear and non-linear load. Support your answer with examples	**07**
Q.2	**(a)**	Discuss in brief the effects of Harmonics on Transformer.	**07**
	(b)	Explain how increase of short circuit ratio helps to reduce harmonics in power systems.	**07**
		OR	
	(b)	Discuss in brief effects of Harmonics on Rotating Machines.	**07**
Q.3	**(a)**	Discuss harmonic sources and their effect on power quality.	**07**
	(b)	How the harmonics effects on lighting devices and relays.	**07**
		OR	
Q.3	**(a)**	Discuss harmonic cancellation using multi pulse converters.	**07**
	(b)	Discuss aim of harmonic flow studies. Draw Z-f plot for series and parallel resonance.	**07**
Q.4	**(a)**	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**
	(b)	Explain the procedure to be carried out to perform harmonic measurement of voltage and current	**07**
		OR	
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)	What are the aspects, which must be considered in the design stage of passive filters for controlling problems associated with harmonics?	**07**
Q.5	**(a)**	Compare Hybrid filter with pure Active Filter.	**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.5	**(a)**	With functional block diagram describe 3- phase 4 wire Unified Power quality Controller (UPQC controller - the combined series and shunt active harmonic Filter) giving a general overview of each functional blocks involved.	**07**
	(b)	In which conditions, harmonics are responsible for neutral conductor over loading? Justify your answer by giving example.	**07**

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