Seat No.: _____ Enrolment No._____

# GUJARAT TECHNOLOGICAL UNIVERSITY

**ME - SEMESTER IV–(OLD) EXAMINATION – SUMMER 2017**

**Subject Code:740701** **Date : 03/05/2017**

**Subject Name: Harmonic Measurements and Filtration Techniques**

**Time: 02:30 pm to 05:00 pm** **Total Marks: 70**

**Instructions:**

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

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|---|---|---|---|
| **Q.1** | **(a)** | Distinguish between linear and non-linear load. Give their examples | **07** |
| | **(b)** | Discuss effects of harmonics on rotating machines and on capacitors. | **07** |
| **Q.2** | **(a)** | Explain working and design aspects of Band pass passive filters. Also discuss its quality factor | **07** |
| | **(b)** | How does harmonic content reduce in synchronous machine by using distributed winding? | **07** |
| | | **OR** | |
| | **(b)** | Explain the following terms:<br>1. Total Harmonic Distortion (THD)<br>2. Total Demand Distortion (TDD)<br>3. Telephone influence factor (TIF) | **07** |
| **Q.3** | **(a)** | Compare Active filter with Passive filters. | **07** |
| | **(b)** | Explain the procedure to be carried out to perform harmonic measurement of voltage and current. | **07** |
| | | **OR** | |
| **Q.3** | **(a)** | Explain how harmonics effects in following operation in power system: (1) Abnormal operation of Electronic relays. (2) Telephonic interference and (3) Energy metering/ Monitoring Equipments. | **07** |
| | **(b)** | Write a short note on Dynamic response of shunt active filter. | **07** |
| **Q.4** | **(a)** | Enlist possible condition, in which Harmonics are generated in Variable frequency drives and Electric furnace type loads. Also, discuss the types of harmonics generated in detailed. | **07** |
| | **(b)** | Explain 3-phase, 3 wire shunt active filter and explain its four functional control blocks. | **07** |
| | | **OR** | |
| **Q.4** | **(a)** | How harmonics are responsible to create Thermal Effects on transformer? Also explain, which harmonics are responsible for overloading of neutral conductor? | **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** |
| **Q.5** | **(a)** | What is UPFC? Explain voltage regulation principle realized by shunt converter of the UPFC with phasor diagrams. | **07** |
| | **(b)** | Discuss basic concept of UPQC. What is difference between UPFC and UPQC? | **07** |
| | | **OR** | |
| **Q.5** | **(a)** | Discuss harmonic sources and their effect on power quality. | **07** |
| | **(b)** | Discuss harmonic cancellation using multi pulse converters. | **07** |

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