Seat No.: _____ *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E -III[rd] SEMESTER–EXAMINATION – MAY- 2012

Subject code:730701 **Date: 08/05/2012**

Subject Name: Power Quality Management

Time: 10:30 am – 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)** Discuss the examples of poor power quality issues in brief. **07**

(b) What is an arc furnace? Explain with suitable diagrams arc furnace can produce large voltage sags in electrical network. Also explain starting/stopping of capacitors banks in conjunction with an arc furnace operation. **07**

Q.2 **(a)** Explain (i) Atmospheric phenomena and (ii) Switching of capacitor banks, which creates the transients in power systems. **07**

(b) A series combination having R=2MΩ and C=0.01μF is connected across a d.c. voltage source of 50V.Determine **07**
(a) Capacitor voltage after 0.02s, 0.04s, 0.06s
(b) Charging current after 0.02s, 0.04s, 0.06s

OR

(b) The load on an installation is 800kW, 0.8 lagging which works for 3000 hours per annum. The tariff is Rs 100 per kVA plus 20 paisa per kWh. If the power factor is improved to 0.9 lagging by means of loss free capacitors costing Rs 60 per kVR, calculate the annual saving effected. Allow 10% per annum for interest and depreciation on capacitors. **07**

Q.3 **(a)** (i)Prove that third harmonics are in phase and have zero displacement angles between them. **04**

(ii) (ii)Define the following terms **03**
1. Displacement Power Factor
2. Flicker
3. Nonlinear load

(b) What is an electromagnetic interference? Discuss the essential elements of EMI. **07**

OR

Q.3 **(a)** Describe how utility can deal with problems related to capacitor switching transients. **07**

(b) Explain various EMI mitigation techniques in detail. **07**

Q.4 **(a)** What do you mean by harmonics?How harmonics are generated in power system network? Support your answer with suitable examples. **07**

(b) A 2000-kVA, 13.8-kV to 480/277-V transformer with a leakage reactance of 6.0% feeding a bus containing two 500-hp adjustable speed drives. A 750-kVAR Y-connected capacitor bank is installed on the 480-V bus for power factor correction. Perform an analysis to determine the conditions for resonance. Assume fundamental frequency is 60Hz. **07**

OR

Q.4 **(a)** How neutral conductor is selected for the site where many computers are used? Discuss the possible solution of neutral conductor overloading. **07**

Q.4 **(b)** (i)Find the total harmonic distortion and individual harmonic distortion of a voltage waveform with the following harmonic frequency make up: **04**

Fundamental=V_1=114V
3^{rd} harmonic=V_3=4V
5^{th} harmonic=V_5=2V
7^{th} harmonic=V_7=1.5V
9^{th} harmonic=V_9=1V

(ii) A complex wave of r.ms value 240V has 20% 3^{rd} harmonic content, 5% 5^{th} harmonic content and 2% 7^{th} harmonic content. Find the r.ms value of the fundamental and of each harmonic. **03**

Q.5 **(a)** What do you mean by distributed generation? Explain the following distributed generation methods and issues of power quality (i) Wind turbines (ii) Photovoltaic systems. **07**

(b) Discuss the effect of harmonics on AC Motors. **07**

OR

Q.5 **(a)** What is the importance of the value of earth's resistance? Describe the fall of potential methods for measurement of earth's resistance. **07**

(b) Discuss the main features of power quality analyzer? Explain instrument setup procedure to measure power quality events. **07**

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