Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E. SEMESTER III–EXAMINATION (Remedial)– WINTER 2015

Subject code: 730701 **Date: 04/12/2015**

Subject Name: Power Quality Management

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.**

Q.1	**(a)**	Define the term "Power Quality". Discuss the common sources of power frequency disturbances with suitable examples.	**07**
	(b)	Explain any two solution methods to solve the power frequency disturbances at the end user level.	**07**
Q.2	**(a)**	Explain the classification of equipment sensitivity to voltage sag events.	**07**
	(b)	Discuss about the Power Quality Standards in India.	**07**
		OR	
	(b)	Who's Involved in the Power Quality Industry? Discuss in detail.	**07**
Q.3	**(a)**	(I). A 1000 KVAR,11KV star connected capacitor bank is connected at the end of 50Km transmission line with an inductive reactance of 0.5Ω/Km. Find the natural frequency of the current that would be drawn during turn on. Take fundamental frequency is 50Hz.	**04**
		(II). Explain the term Area of vulnerability.	**03**
	(b)	Explain in brief the common causes of transients in power system network.	**07**
		OR	
Q.3	**(a)**	Explain the term "Distribution Generation". Discuss the various DG technologies in brief.	**07**
	(b)	Define the terms "Grounding and Bonding". If improper grounding is found in commercial building what will be the effect on sensitive equipments. Give your suggestions to solve this power quality problem.	**07**
Q.4	**(a)**	Explain the effect of harmonics on rotating machines.	**07**
	(b)	(I).Determine the K rating of a transformer required to carry a load consisting of 100A of fundamental,40A of third harmonics,20A of fifth harmonics,10A of seventh harmonics.	**04**
		(II).A 33KV,6.8 MVAR, Capacitor bank is to be used as a second order damped filter tuned to $h_n \geq 4$.Find the elements of the filter. Take Q=0.5, 2, 3, 5.	**03**

OR

Q.4 (a) Discuss the thermal effects on transformers due to harmonic problems. **07**

Q.4 (b) An industrial substation supplies lighting, induction motor, and synchronous motor load as given below: **07**

Lighting load=40kW at unity power factor
Induction motor load=100kW at 0.7 power factor
Synchronous motor load=200kW at 0.9 power factor

Find the kW, kVAR, and power factor of each load. Also find the kW, kVAR, and power factor at the substation level. If the power factor is to be improved to 0.95 with capacitors. How much shunt capacitor kVAR is needed?

Q.5 (a) Explain the main steps to monitor the power quality problems at site. **07**

(b) (I).A drive with nominal DC bus voltage V_0=620V and DC bus capacitance C=4400µF powers an ac motor taking an active power P=86KW.The drive trips when the DC bus voltage below V_{min}=560V. **04**
Calculate (a) time to trip the ASD.
(b) For the same drive, Calculate the capacitance needed so that the drive is able to tolerate sags with duration up to 500ms.The under voltage setting remains at 560V.

(II).A 5µF capacitor is charged through a resistance of 100 kΩ (a) Calculate the time constant of the circuit. **03**
(b) Find the time it takes for the capacitor to reach 90% of the final charge.

OR

Q.5 (a) Discuss the active and passive filters to control the harmonics in power system. **07**

(b) Given $f(t) = t, -1 \leq t \leq 1$ **07**
$f(t+2) = f(t)$,
Sketch the graph of $f(t)$ such that $-3 \leq t \leq 3$.Compute the Fourier series expansion of $f(t)$. Plot the amplitude and phase spectra until the forth harmonic.

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