

# APPROVAL SHEET

The report entitled Determination of Kanai – Tajimi Parameter Using Adaptive Filter is approved for the degree of M.Tech.

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**DECLARATION**

I declare that this written submission represents my idea in my own words and where other ideas or words have been included; I have adequately cited and referenced the original sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission. I understand that any violation of the above will be a cause of disciplinary action by the institute and also invoke penal action from the sources which have thus not been properly cited or from whom permission has not been taken when needed.

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**(signature)**

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## ABSTRACT

Kanai – Tajimi parameters are used to characterize the strong ground motion. These parameters for different earthquake data are estimated from power spectral density vs frequency graph using spectral moments. In this thesis first earthquake signal is predicted from Adaptive filter then PSD vs frequency graph is obtained using low pass filter.

In order to monitor, the change with earthquake shaking, the Kanai –Tajimi parameters (i.e natural frequency and damping ratio of soil layer) are also identified based on windowed data of earthquake using a moving time window. This thesis provides a method for estimating dynamic variations of K-T frequency and damping ratio parameter of soil related very closely to the non-linear earthquake responses of ground. It is showed that nonlinear responses with great reduction in soil natural frequency and increase of soil damping ratio occurred during the strong ground motion. Such a reduction of K-T frequency parameter and increase in K-T damping ratio parameter was found to have time – varying characteristics, so the further topic of this study focused for analyzing non-stationary variation of K-T parameter.

Keywords: Ground motion, Normalized Least Mean Square Filter, Power Spectral Density, Kanai and Tajimi parameters.

# CONTENTS

<b>APPROVAL SHEET.....</b>	<b>(i)</b>
<b>DECLARATION.....</b>	<b>(ii)</b>
<b>ACKNOWLEDGEMENT.....</b>	<b>(iii)</b>
<b>ABSTRACT.....</b>	<b>(iv)</b>
<b>CONTENTS.....</b>	<b>(v)</b>
<b>LIST OF FIGURES.....</b>	<b>(viii)</b>
<b>LIST OF SYMBOLS AND ABBREVIATIONS.....</b>	<b>(xi)</b>
<b>CHAPTER 1- INTRODUCTION.....</b>	<b>(1)</b>
1.1- General.....	(1)
1.2 - Objective of the present work.....	(3)
1.3 - Outline of Thesis.....	(3)
<b>CHAPTER 2 – LITERATURE REVIEW.....</b>	<b>(6)</b>
<b>CHAPTER 3 – GROUND MOTION PARAMETERS.....</b>	<b>(7)</b>
3.1 - General.....	(7)
3.2 - Amplitude Parameters.....	(7)
3.2.1 –Peak Acceleration.....	(7)
3.3 – Frequency Content Parameter.....	(8)
3.3.1 – Power Spectra.....	(8)
3.4 – Duration of Motion.....	(8)
<b>CHAPTER 4 – ADAPTIVE FILTER.....</b>	<b>(10)</b>

4.1 - General.....	(10)
4.2 – Discrete Time Processing of Signals.....	(10)
4.2.1 –Signal.....	(10)
4.2.2 – Deterministic and Random Signals.....	(10)
4.2.3. - Convolution.....	(10)
4.2.4 – Cross-correlation and Auto-Correlation.....	(11)
4.2.5 –Filter.....	(11)
4.2.6 –Digital Filter.....	(11)
4.3- Types of Adaptive Filter.....	(12)
4.3.1 –Time Variant Wiener Filter.....	(12)
4.3.1.1 –Design of Time –Variant Wiener Filter.....	(12)
4.3.2 –Normalized Least mean Square.....	(13)
4.3.2.1 Steepest Descent method.....	(13)
4.3.2.2 Algorithm of NLMS.....	(15)
4.3.2.3 Output of normalized least mean square.....	(15)
<b>CHAPTER 5 – POWER SPECTRAL DENSITY.....</b>	<b>(17)</b>
5.1 – PSDF of Filtered data using El-Centro.....	(17)
5.2 –PSDF of Filtered data using Chamoli.....	(23)
5.3 –PSDF of Filtered data using Nongstoin, North-East, India.....	(27)
<b>CHAPTER 6 –SPECTRAL DENSITY FUNCTION.....</b>	<b>(35)</b>
6.1 - General.....	(35)
6.2 –Bandwidth.....	(35)

6.3 – Central Frequency.....	(35)
6.4 – Shape Factor.....	(35)
6.5 - Kanai-Tajimi parameter.....	(35)
6.5.1 – Method of moments for fitting PSD spectrum.....	(36)
<b>CHAPTER7 –KANAI-TAJIMI PARAMETER FOR DIFFERENT EARTHQUAKE...</b>	<b>(37)</b>
7.1 – Kanai Tajimi parameter for El-Centro Earthquake.....	(37)
7.2 –Kanai Tajimi parameter for Chamoli Earthquake.....	(38)
7.3 –Kanai Tajimi parameter for North-East, India.....	(39)
<b>CHAPTER 8 – MAIN CONCLUSION AND FURTRE SCOPE OF WORK.....</b>	<b>(41)</b>
<b>REFERENCES.....</b>	<b>(42)</b>
<b>APPENDIX</b>	

## LIST OF FIGURES

Fig 3.1 Acceleration Time History of El – Centro Earthquake

Figure 4.1 Plot of El-Centro, 1940 and filtered WGN

Figure 4.2 Plot of Chamoli, 1999 and filtered WGN.

Figure 4.3 Plot of Nongstain, N-E, India and filtered WGN

Figure 5.1 Acceleration – time history and PSDF plot for time window 1 of El-Centro.

Figure 5.2 Acceleration – time history and PSDF plot for time window 2 of El-Centro.

Figure5.3. Acceleration–time history and PSDF plot for time window 3 of El-Centro.

Figure5. 4 Acceleration–time history and PSDF plot for time window 4 of El-Centro.

Figure 5.5 Acceleration–time history and PSDF plot for time window 5 of El-Centro.

Figure 5.6 Acceleration–time history and PSDF plot for time window 6 of El-Centro.

Figure 5.7.Acceleration–time history and PSDF plot for time window 7 of El-Centro.

Figure5.8. Acceleration–time history and PSDF plot for time window 8 of El-Centro.

Figure 5.9 Acceleration–time history and PSDF plot for time window 9 of El-Centro.

Figure 5.10Acceleration–time history and PSDF plot for time window 10 of El-Centro.

Figure 5.11Acceleration-time history and PSDF plot for time window 1 of Chamoli, 1999.

Figure 5.12 Acceleration-time history and PSDF plot for time window 2 of Chamoli, 1999.

Figure 5.13 Acceleration-time history and PSDF plot for time window 3 of Chamoli, 1999.

Figure 5.14 Acceleration-time history and PSDF plot for time window 4 of Chamoli, 1999.

Figure 5.15 Acceleration-time history and PSDF plot for time window 5 of Chamoli, 1999.

Figure 5.16 Acceleration-time history and PSDF plot for time window 6 of Chamoli, 1999.



Figure 5.17 Acceleration-time history and PSDF plot for time window 7 of Chamoli, 1999.

Figure 5.18 Acceleration-time history and PSDF plot for time window 8 of Chamoli, 1999.

Figure 5.19 Acceleration-time history and PSDF plot for time window 1 of N-E, India.

Figure 5.20 Acceleration-time history and PSDF plot for time window 2 of N-E, India.

Figure 5.21 Acceleration-time history and PSDF plot for time window 3 of N-E, India.

Figure 5.22 Acceleration-time history and PSDF plot for time window 4 of N-E, India.

Figure 5.23 Acceleration-time history and PSDF plot for time window 5 of N-E, India.

Figure 5.24 Acceleration-time history and PSDF plot for time window 6 of N-E, India.

Figure 5.25 Acceleration-time history and PSDF plot for time window 7 of N-E, India.

Figure 5.26 Acceleration-time history and PSDF plot for time window 8 of N-E, India.

Figure 5.27 Acceleration-time history and PSDF plot for time window 9 of N-E, India.

Figure 5.28 Acceleration-time history and PSDF plot for time window 10 of N-E, India.

Figure 5.29 Acceleration-time history and PSDF plot for time window 11 of N-E, India.

Figure 5.30 Acceleration-time history and PSDF plot for time window 12 of N-E, India.

Figure 5.31 Acceleration-time history and PSDF plot for time window 13 of N-E, India.

Figure 5.32 Acceleration-time history and PSDF plot for time window 14 of N-E, India.

Figure 5.33 Acceleration-time history and PSDF plot for time window 15 of N-E, India.

Figure 5.34 Acceleration-time history and PSDF plot for time window 16 of N-E, India.

Figure7.1 Plot of Acceleration time history El- Centro and Kanai –Tajimi frequency parameter.

Figure7.2 Plot of Acceleration time history El- Centro and Kanai –Tajimi damping ratio parameter.

Figure 7.3 Plot of Acceleration time history Chamoli,1999 and Kanai –Tajimi frequency parameter.

Figure 7.4 Plot of Acceleration time history Chamoli, 1999 and Kanai –Tajimi damping ratio parameter.

Figure 7.5 Plot of Acceleration time history Bhuj, 2001 and Kanai –Tajimi frequency parameter.

Figure 7.6 Plot of Acceleration time history Bhuj, 2001 and Kanai –Tajimi damping ratio parameter.

Figure 7.7 Plot of Acceleration time history North-East, India and Kanai –Tajimi frequency parameter.

Figure 7.8 Plot of Acceleration time history North-East, India and Kanai –Tajimi damping ratio parameter.

## LIST OF SYMBOLS AND ABBREVIATIONS

$m$	mass of the system
$c$	damping constant
$k$	Spring constant
$H(\omega)$	Transfer function
$\omega_g$	natural frequency
$G(\omega)$	Spectral Density Function
$\xi_g$	Damping ratio
$U_s$	absolute amplitude of seismic waves reaching the bottom boundary of the surface layer
$T$	Time period
$r_{xy}$	Cross-correlation
$r_{xx}$	Auto-correlation
$w$	Filter coefficient
$\mu$	Step size of LMS filter
$\lambda_j$	jth Spectral moment
$\omega$	Central frequency
$\delta$	Shape factor