

# UNIVERSITI MALAYSIA PAHANG

## BORANG PENGESAHAN STATUS TESIS ♦

**JUDUL:** VIBRATION SUPPRESSION OF FLEXIBLE BEAM USING EDDY CURRENT DAMPER

**SESI PENGAJIAN:** 2012/2013

Saya, HASAN BIN ZAINAL ABIDIN (900515-10-5519)

mengaku membenarkan tesis (Sarjana Muda / ~~Sarjana~~ / ~~Doktor Falsafah~~)\* ini disimpan di perpustakaan dengan syarat-syarat kegunaan seperti berikut:

1. Tesis ini adalah hakmilik Universiti Malaysia Pahang (UMP).
2. Perpustakaan dibenarkan membuat salinan untuk tujuan pengajian sahaja.
3. Perpustakaan dibenarkan membuat salinan tesis ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. \*\*Sila tandakan (√)

**SULIT**

(Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia seperti yang termaktub di dalam AKTA RAHSIA RASMI 1972)

**TERHAD**

(Mengandungi maklumat TERHAD yang telah ditentukan oleh organisasi / badan di mana penyelidikan dijalankan)

**TIDAK TERHAD**

Disahkan oleh:

\_\_\_\_\_  
(TANDATANGAN PENULIS)

\_\_\_\_\_  
(TANDATANGAN PENYELIA)

Alamat Tetap:

**LOT 4674, PARIT 2 BARAT/BANAT**  
**45300 SUNGAI BESAR**  
**SELANGOR**

**DR. GIGIH PRIYANDOKO**  
(Nama Penyelia)

Tarikh:

Tarikh:

CATATAN: \* Potong yang tidak berkenaan.

\*\* Jika tesis ini SULIT atau TERHAD, sila lampirkan surat daripada pihak berkuasa/organisasi berkenaan dengan menyatakan sekali tempoh tesis ini perlu dikelaskan sebagai SULIT atau TERHAD.

♦ Tesis dimaksudkan sebagai tesis bagi Ijazah Doktor Falsafah dan Sarjana secara Penyelidikan, atau disertasi bagi pengajian secara kerja kursus dan penyelidikan, atau Laporan Projek Sarjana Muda (PSM).

VIBRATION SUPPRESSION OF FLEXIBLE BEAM USING EDDY CURRENT  
DAMPER

HASAN BIN ZAINAL ABIDIN

Thesis submitted in fulfilment of the requirements  
for award of the degree of  
Bachelor of Mechanical Engineering with Automotive Engineering

Faculty of Mechanical Engineering  
UNIVERSITI MALAYSIA PAHANG

JUNE 2013

## TABLE OF CONTENTS

	<b>Page</b>
<b>TITLE</b>	i
<b>EXAMINER’S APPROVAL DOCUMENT</b>	ii
<b>SUPERVISOR’S DECLARATION</b>	iii
<b>STUDENT’S DECLARATION</b>	iii
<b>DEDICATION</b>	v
<b>ACKNOWLEDGEMENTS</b>	vi
<b>ABSTRACT</b>	vii
<b>ABSTRAK</b>	viii
<b>TABLE OF CONTENTS</b>	ix
<b>LIST OF TABLES</b>	xii
<b>LIST OF FIGURES</b>	xiii
<b>CHAPTER 1    INTRODUCTION</b>	
1.1            Background of the Study	1
1.2            Problem Statement	2
1.3            Objectives	2
1.4            Scopes of Research	2

**CHAPTER 2 LITERATURE REVIEW**

2.1	The Production of Eddy Current	3
2.2	Experimenting Eddy Current Damper	5
2.3	Justification On Theoretical of Eddy current Damper	5
2.4	Recent Research Involving Inductor coil	7
2.5	Dynamic Characteristics of Eddy Current Damper	10

**CHAPTER 3 METHODOLOGY**

3.1	Project Flowchart	15
3.2	Experiment Setup	17
3.3	Materials and Apparatus Used	19
	3.3.1 Conductive Material (Mild Steel Rod)	19
	3.3.2 Direct Current (DC) Motor	20
	3.3.3 Power Supply For DC Motor and Coils	20
	3.3.4 Aluminium Beam	21
	3.3.5 Accelerometer	21
	3.3.6 DAQ Component	22
	3.3.7 Two Different Types of Coils	22
3.4	Dasylab Software	23

**CHAPTER 4 RESULTS AND DISCUSSION**

4.1	Without Eddy Current Damper Versus First Cylindrical Coil	25
4.2	Comparison For All Cylindrical Coils	27
4.3	Comparison For All Square Coils	30
4.4	Final Comparison of Frequency Response	31

**CHAPTER 5 CONCLUSION AND RECOMMENDATIONS**

5.1	Conclusions	33
5.2	Recommendations	34

<b>REFERENCES</b>	35
-------------------	----

<b>APPENDICES</b>	38
-------------------	----

**LIST OF TABLES**

<b>TABLE NO.</b>	<b>TITLE</b>	<b>PAGE</b>
3.1	Main parameter of both coils	22
4.1	Comparison between frequency response without eddy current and first cylindrical coil	27
4.2	Main parameter of all cylindrical coils	27
4.3	Highest peak frequency for all cylindrical coils	29
4.4	Main parameter of all squared coils	30
4.5	Highest peak frequency for all squared coils	31
4.6	Final comparison of frequency response	32

## LIST OF FIGURES

<b>FIGURE NO.</b>	<b>TITLE</b>	<b>PAGE</b>
2.1	Schematic the generation of eddy currents	4
2.2	Eddy current damper induced with conductive plate	9
2.3	Eddy current damper and electromagnetic actuator induced with copper coil	9
2.4	Cylindrical tube	10
2.5	Squared tube	10
2.6	Circular tube	10
3.1	Project flowchart 1	16
3.2	Project flowchart 2	17
3.3	Top view of whole experiment setup	18
3.4	Close-up view of whole experiment setup	19
3.5	Mild steel rod	19
3.6	DC motor (Cytron 185 rpm)	20
3.7	9 volts battery	20
3.8	Aluminium beam	21
3.9	Accelerometer	21
3.10	DAQ component	22
3.11	Cylindrical coil	22
3.12	Squared coil	22
3.13	The modules involved in this DASYPYLAB software	24
4.1	Frequency response without eddy current	26

4.2	Frequency response without eddy current and first cylindrical coil	26
4.3	Frequency response of first cylindrical coil	28
4.4	Frequency response of second cylindrical coil	28
4.5	Frequency response of third cylindrical coil	28
4.6	Frequency response of first squared coil	30
4.7	Frequency response of second squared coil	30
4.8	Frequency response third squared coil	31
4.9	Final comparison of frequency response	32