|  |
| --- |
|  |
| **SAMSUN UNIVERSITY** |
| **FACULTY OF AERONAUTICS AND ASTRONAUTICS** |
| **DEPARTMENT OF AEROSPACE ENGINEERING** |

|  |
| --- |
| **PROJECT TITLE** |

|  |
| --- |
| **DESIGN PROJECT** |
| **Name SURNAME** |

|  |
| --- |
| **MONTH, YEAR** |
|  |

|  |
| --- |
|  |
| **SAMSUN UNIVERSITY** |
| **FACULTY OF AERONAUTICS AND ASTRONAUTICS** |
| **DEPARTMENT OF AEROSPACE ENGINEERING** |

|  |
| --- |
| **PROJECT TITLE** |

|  |
| --- |
| **DESIGN PROJECT** |
| **Name SURNAME** |
| **(Student ID)** |

|  |  |  |
| --- | --- | --- |
| **Advisor:** | **Name SURNAME** | **…………….** |
| **Juri Members:** | **Name SURNAME** | **…………….** |
|  | **Name SURNAME** | **…………….** |

|  |  |
| --- | --- |
| **Date of submission:** | **12 January 2019** |

FOREWORD

Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text

|  |  |
| --- | --- |
| January 2019 | Name SURNAME |

TABLE OF CONTENTS

Table of Contents

FOREWORD v

TABLE OF CONTENTS vii

ABBREVIATIONS ix

LIST OF TABLES xi

LIST OF FIGURES xiii

SUMMARY xv

ÖZET xvii

1. INTRODUCTION 1

1.1. Literature Review 1

1.2. Purpose of Project 2

1.3. Scope 2

1.3.1.1. Motivation 2

2. ANALYTICAL MODELLING 3

2.1. Euler-Bernoulli Beam Theory 3

2.1.1. Model 1 3

2.1.1.1. Static analysis results 3

2.2. Timoshenko Beam Theory 4

3. RESULTS AND DISCUSSION 6

3.1. Review of Models 6

3.1.1. Model 1 6

3.1.2. Static analysis results 6

3.1.2.1. Dynamic analysis results 7

3.2. Model 2 7

3.3. Comparison of Model 1 and Model 2 8

3.4. Effect of Sweep Angle 11

4. CONCLUSION AND FUTURE WORKS 13

4.1. Conclusion 13

4.2. Future Works 13

REFERENCES 14

APPENDIX A 16

APPENDIX B 17

ABBREVIATIONS

**CUS :** Circunferentially Uniform Stiffness

**CAS :** Circunferentially Asymmetric Stiffness

**FEM :** Finite Element Method

**xFEM :** Extended Finite Element Method

**FVM :** Finite Volume Method

**FSI :** Fluid Structure Interaction

**BEM :** Blade Element Theory

**IES :** Ion Engine System

LIST OF TABLES

**Page**

1. Table captions.. 4

**Table 3.1 :** Table captions.. 4

**Table 3.2 :** Table captions.. 4

**Table 3.3 :** Table captions.. 4

LIST OF FIGURES

**Page**

[**Figure 1.1 :** Figure caption 1](#_Toc532744447)

[**Figure 2.1 :** Cross-section 4](#_Toc532744430)

[**Figure 2.2 :** Figure caption. 5](#_Toc532744431)

[**Figure 3.1 :** Figure caption 6](#_Toc532744800)

[**Figure 3.2 :** Figure caption 7](#_Toc532744801)

[**Figure 3.3 :** Figure caption 8](#_Toc532744802)

[**Figure 3.4 :** Figure caption 9](#_Toc532744803)

[**Figure 3.5 :** Figure caption 11](#_Toc532744804)

[**Figure 3.6 :** Figure caption 12](#_Toc532744805)

[**Figure A.1 :** (a) Sample figure a, (a) Sample figure b, (b) Sample figure c and (d) Sample figure d 16](#_Toc532744806)

**PROJECT TITLE (ENGLISH)**

SUMMARY

Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text.

Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text.

Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text.

**PROJE BAŞLIĞI (TÜRKÇE)**

ÖZET

Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin.

Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin.

Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin Örnek metin.

1. INTRODUCTION

Sample text Sample text Sample text Sample text Sample text “Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text.

* 1. Literature Review

Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text.

Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text.

SAMPLE FIGURE

1. Figure caption

Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample

* 1. Purpose of Project

Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text.

Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text.

* 1. Scope

Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text.

* + - 1. Motivation

Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text.

1. ANALYTICAL MODELLING

Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text

* 1. Euler-Bernoulli Beam Theory

Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text.

|  |  |
| --- | --- |
|  | (2.1) |

Sample text text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text.

* + 1. Model 1

Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text.

* + - 1. Static analysis results

Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text.

Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text.

SAMPLE FIGURE

1. Cross-section

Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample

|  |  |
| --- | --- |
|  | (2.2) |

where

|  |  |
| --- | --- |
|  | (2.3) |

* 1. Timoshenko Beam Theory

Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text

1. Table caption.

|  |  |  |  |
| --- | --- | --- | --- |
| abcd | abcd | abcd | abcd |
| 123 | 123 | 123 | 123 |
| 123 | 123 | 123 | 123 |
| 123 | 123 | 123 | 123 |
| 123 | 123 | 123 | 123 |

Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text.

SAMPLE FIGURE

1. Figure caption.
2. RESULTS AND DISCUSSION
   1. Review of Models

Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text

* + 1. Model 1

Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text.

* + 1. Static analysis results

Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text.

SAMPLE FIGURE

1. Figure caption
   * + 1. Dynamic analysis results

Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text.

SAMPLE FIGURE

1. Figure caption

Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample

1. Table caption

|  |  |  |  |
| --- | --- | --- | --- |
| abcd | abcd | abcd | abcd |
| 123 | 123 | 123 | 123 |
| 123 | 123 | 123 | 123 |
| 123 | 123 | 123 | 123 |
| 123 | 123 | 123 | 123 |
| 123 | 123 | 123 | 123 |
| 123 | 123 | 123 | 123 |
| 123 | 123 | 123 | 123 |
| 123 | 123 | 123 | 123 |

* 1. Model 2

Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample

1. Table caption

|  |  |  |  |
| --- | --- | --- | --- |
| abcd | abcd | abcd | abcd |
| 123 | 123 | 123 | 123 |
| 123 | 123 | 123 | 123 |
| 123 | 123 | 123 | 123 |
| 123 | 123 | 123 | 123 |
| 123 | 123 | 123 | 123 |
| 123 | 123 | 123 | 123 |
| 123 | 123 | 123 | 123 |
| 123 | 123 | 123 | 123 |

Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text

SAMPLE FIGURE

1. Figure caption

Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text

* 1. Comparison of Model 1 and Model 2

Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text

SAMPLE FIGURE

1. Figure caption

Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text

1. Table caption

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| abcd | abcd | abcd | abcd | abcd | abcd | abcd |
| 123 | 123 | 123 | 123 | 123 | 123 | 123 |
| 123 | 123 | 123 | 123 | 123 | 123 | 123 |
| 123 | 123 | 123 | 123 | 123 | 123 | 123 |
| 123 | 123 | 123 | 123 | 123 | 123 | 123 |
| 123 | 123 | 123 | 123 | 123 | 123 | 123 |
| 123 | 123 | 123 | 123 | 123 | 123 | 123 |
| 123 | 123 | 123 | 123 | 123 | 123 | 123 |
| 123 | 123 | 123 | 123 | 123 | 123 | 123 |
| 123 | 123 | 123 | 123 | 123 | 123 | 123 |
| 123 | 123 | 123 | 123 | 123 | 123 | 123 |
| 123 | 123 | 123 | 123 | 123 | 123 | 123 |
| 123 | 123 | 123 | 123 | 123 | 123 | 123 |
| 123 | 123 | 123 | 123 | 123 | 123 | 123 |
| 123 | 123 | 123 | 123 | 123 | 123 | 123 |
| 123 | 123 | 123 | 123 | 123 | 123 | 123 |
| 123 | 123 | 123 | 123 | 123 | 123 | 123 |
| 123 | 123 | 123 | 123 | 123 | 123 | 123 |
| 123 | 123 | 123 | 123 | 123 | 123 | 123 |
| 123 | 123 | 123 | 123 | 123 | 123 | 123 |
| 123 | 123 | 123 | 123 | 123 | 123 | 123 |
| 123 | 123 | 123 | 123 | 123 | 123 | 123 |
| 123 | 123 | 123 | 123 | 123 | 123 | 123 |
| 123 | 123 | 123 | 123 | 123 | 123 | 123 |

* 1. Effect of Sweep Angle

Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text

SAMPLE FIGURE

1. Figure caption

SAMPLE FIGURE

1. Figure caption
2. CONCLUSION AND FUTURE WORKS
   1. Conclusion

Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text

* 1. Future Works

Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text Sample text

REFERENCES

1. Zhou Y, (2013) Development of Lightweight Soft Body Armour for Ballistic Protection, *PhD Thesis*, University of Manchester.
2. Yang H H, (1992) Kevlar Aramid Fiber, John Wiley &Sons Ltd, New York, 1992.
3. Rakhmatulin KhA, (1947) Impact on a flexible fiber, Prikl Mat Mekh 11, 379–82 (in English).
4. Zeng X S, Shim V P W, Tan V B C, (2005) Influence of boundary conditions on the ballistic performance of high-strength fabric targets, *Int J Impact Eng* 32, 631–642.

**APPENDICES**

**APPENDIX A:** Airfoil Data

**APPENDIX B:** Code

APPENDIX A

|  |  |
| --- | --- |
| SAMPLE FIGURE | SAMPLE FIGURE |
| (a) | (b) |
| SAMPLE FIGURE | SAMPLE FIGURE |
| (c) | (d) |

1. (a) Sample figure a, (a) Sample figure b, (b) Sample figure c and (d) Sample figure d

APPENDIX B

|  |  |
| --- | --- |
|  |  |

clc

clear

close all

tic

% Change default axes fonts.

set(0,'DefaultAxesFontName', 'Times New Roman')

.

.

.

.