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| FACULTY OF ENGINEERING |  | CAIRO UNIVERSITY | Application  Description automatically generated with medium confidence |
| 4th Year | | | |
| Course: Electrical Power Systems (3)  (EPE4010) | | | |

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Assignment no.: HW1 - HW2

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# TABLE OF CONTENTS

[TABLE OF CONTENTS 2](#_Toc154229856)

[Acceleration time from 60mph – 80mph: 3](#_Toc154229857)

[System Modification: 3](#_Toc154229858)

[Initiation model: 4](#_Toc154229859)

[Results: 5](#_Toc154229860)

[Acceleration time from 60mph – 80mph: 6](#_Toc154229861)

[System Modification: 6](#_Toc154229862)

[6](#_Toc154229863)

[Initiation Model: 7](#_Toc154229864)

[Results: 8](#_Toc154229865)

[Basic EV model development to validate acceleration specification. 9](#_Toc154229866)

[Validation of acceleration specification using a basic EV simulation model 9](#_Toc154229867)

[INITIAL CONDITIONS 9](#_Toc154229868)

[Verify the analytical results of (a) via simulation using the following steps: 10](#_Toc154229869)

[Build the basic EV Simulink simulation model described in the “Intro to MATLAB/Simulink” supplementary lecture (posted online with the course lectures) 11](#_Toc154229870)

[Simulate the model with the parameters above and show the resulting plot with speed v [mph] and tractive propulsion force Fv [N] and the solved acceleration time ta. 12](#_Toc154229871)

[Verify the analytical results of (b) via simulation using the following steps 13](#_Toc154229872)

[System Simulation of Leaf-Sized Electric Vehicle 18](#_Toc154229873)

[Run the driving cycle eudc with tstop=1200 at two gear ratios, gratio = 7.94 and version from (a). 20](#_Toc154229874)

HW1

# Acceleration time from 60mph – 80mph:

## System Modification:

A computer screen shot of a computer

Description automatically generatedModification of the input drive cycle to step input changes from 60mph (26.82 m/s) to 80mph (35.76 m/s) to test the response of the model and the acceleration time needed to reach 80mph.

A screenshot of a computer program

Description automatically generated

## A screenshot of a computer Description automatically generatedInitiation model:

## A screenshot of a computer Description automatically generatedA screenshot of a computer Description automatically generatedResults:

Ta = (16.88 - 16.66) \* 60 = 13.2 sec

# Acceleration time from 0 mph – 60mph:

## System Modification:

A computer screen shot of a computer

Description automatically generatedModification of the input drive cycle to step input changes from 0 mph (0 m/s) to 60mph (26.82 m/s) to test the response of the model and the acceleration time needed to reach 0 mph.

# A screenshot of a computer Description automatically generated

## A screenshot of a computer Description automatically generatedInitiation Model:

## Results:

A screenshot of a computer

Description automatically generated

Ta = 0.2459 \* 60 = 14.754 sec

HW2

# Basic EV model development to validate acceleration specification.

# Validation of acceleration specification using a basic EV simulation model

## INITIAL CONDITIONS

A close-up of a computer code

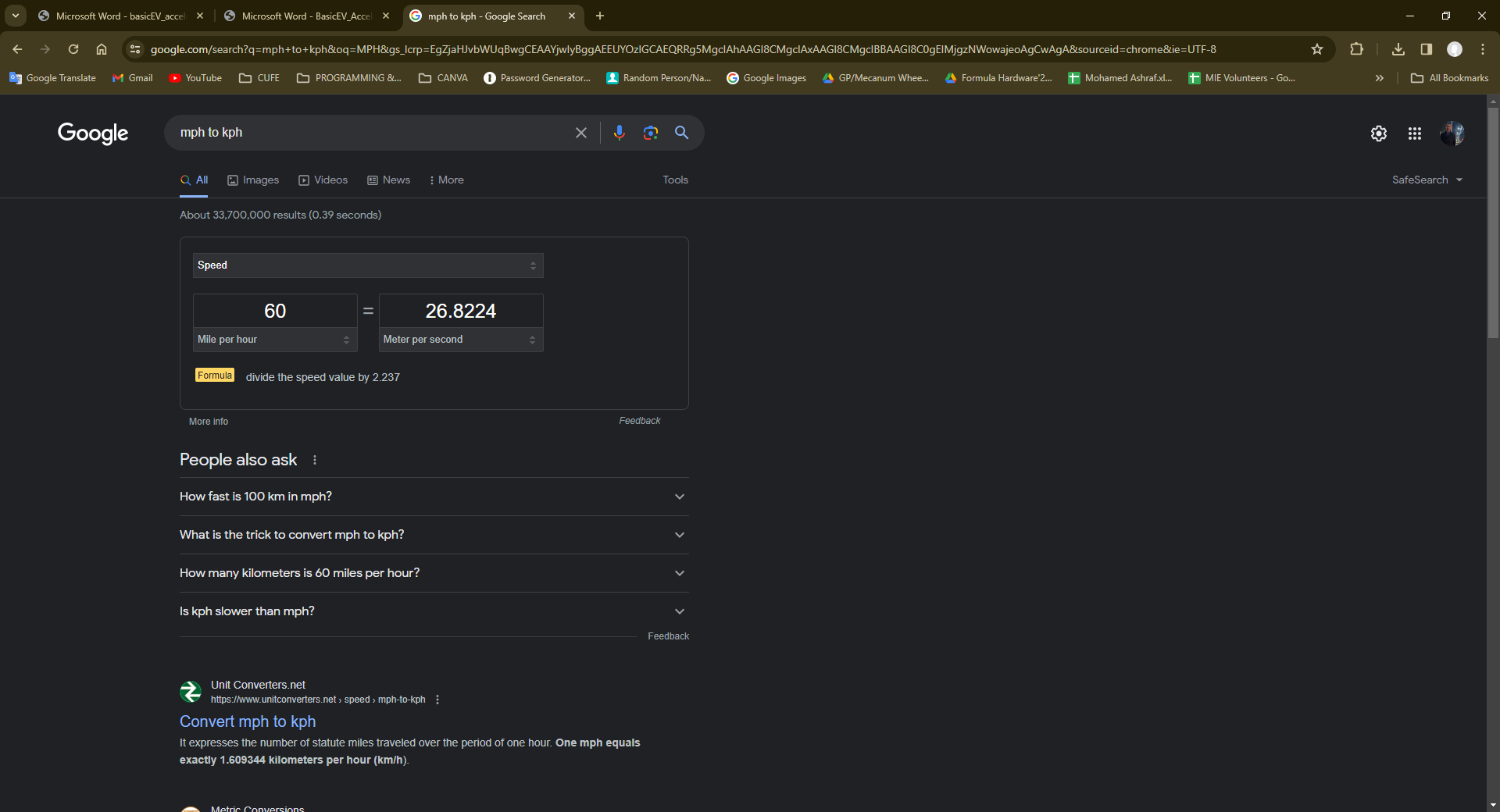
Description automatically generated



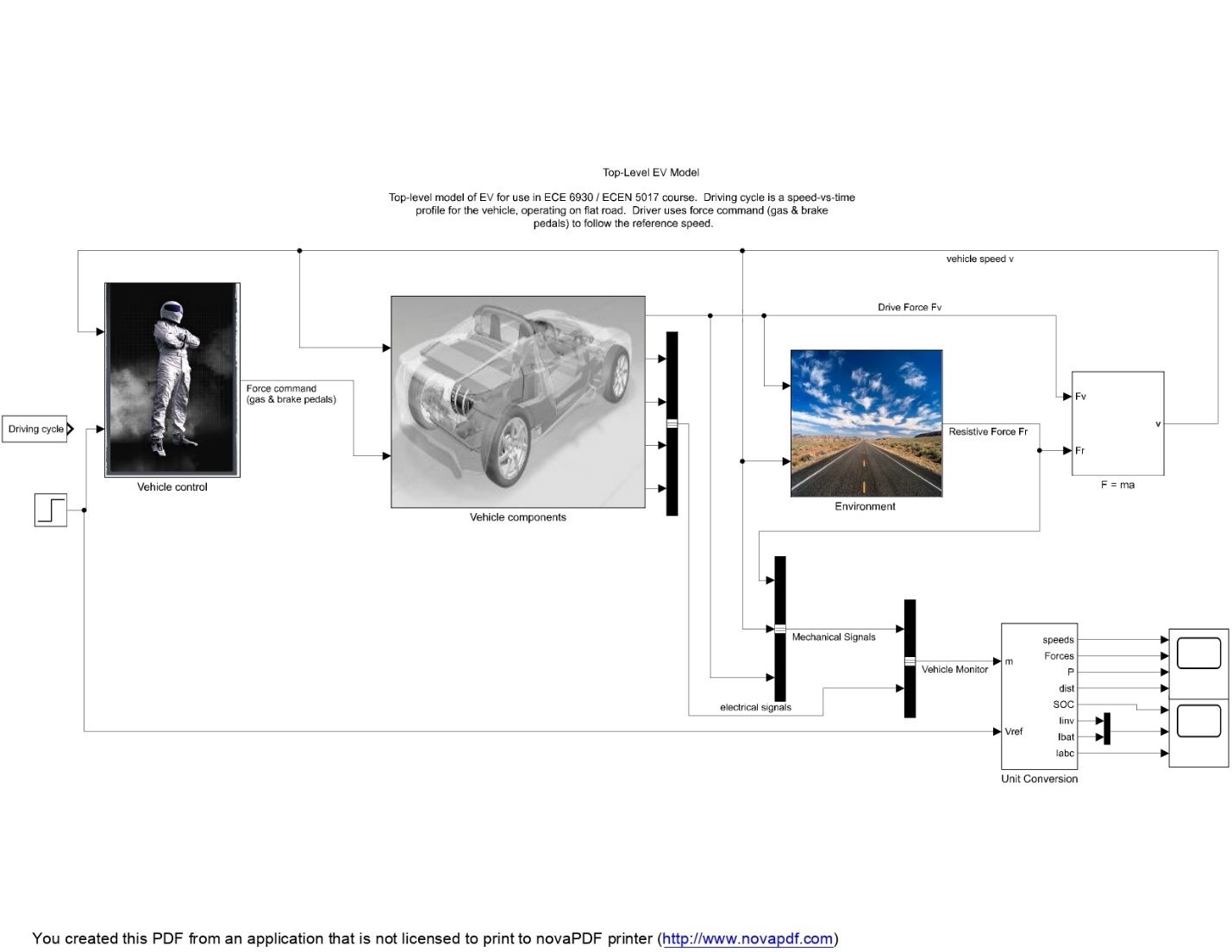
## Verify the analytical results of (a) via simulation using the following steps:

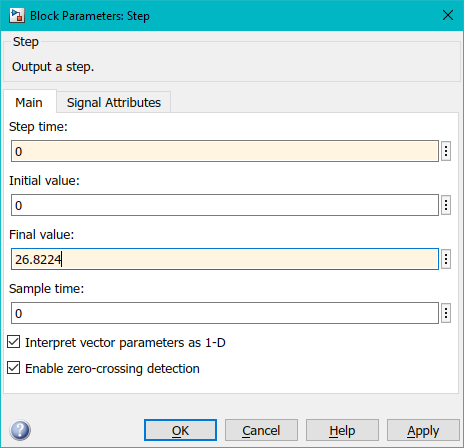
*N.B. 1: a) Solve the approximate accelerate time ta from 0 to 60 MPH.*

*N.B. 2: 60MPH = 26.8224 M/S.*



## Build the basic EV Simulink simulation model described in the “Intro to MATLAB/Simulink” supplementary lecture (posted online with the course lectures)





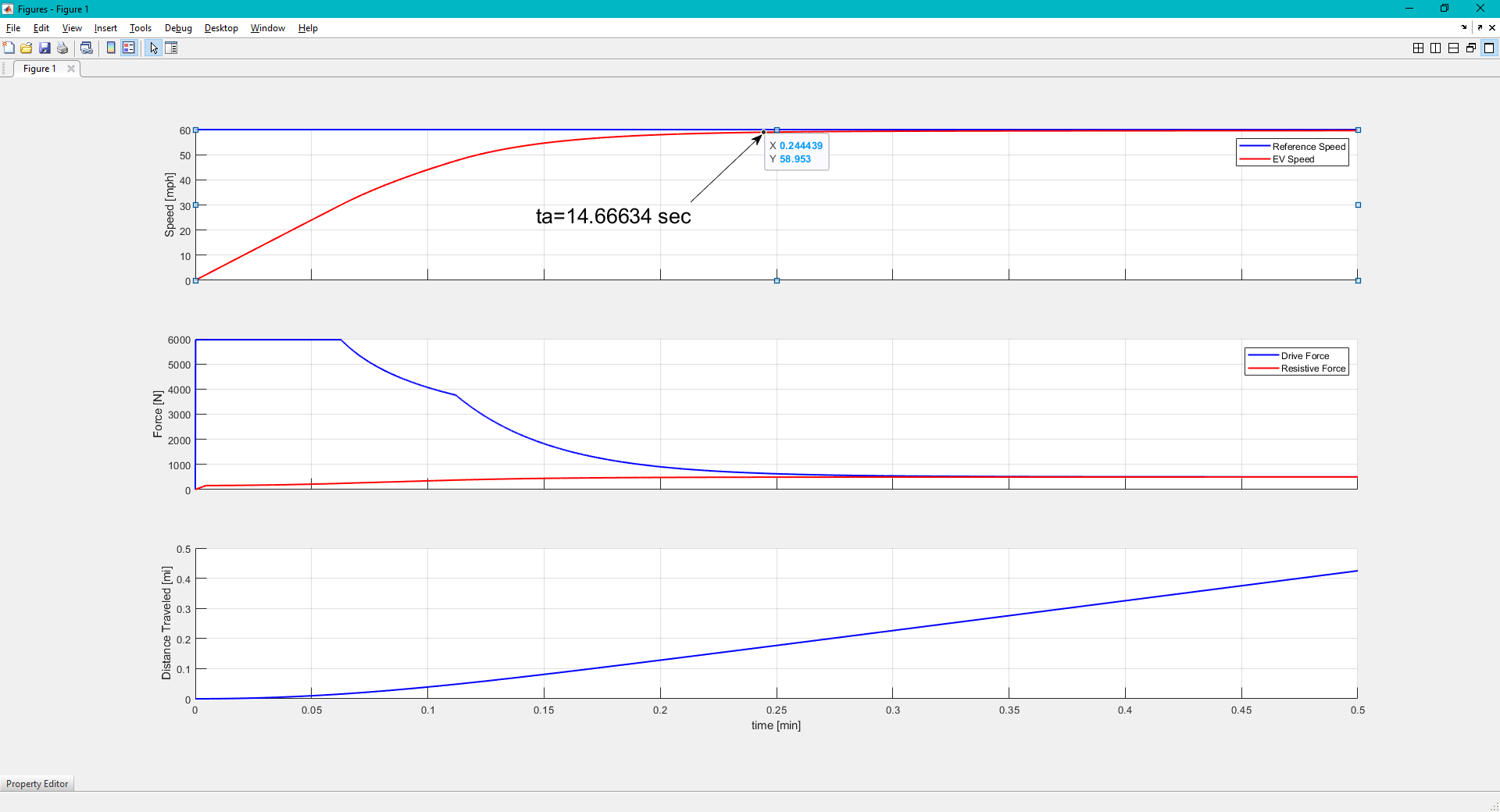
## Simulate the model with the parameters above and show the resulting plot with speed v [mph] and tractive propulsion force Fv [N] and the solved acceleration time ta.

OUTPUTS OF THE SIMULATION (v, Fv, DISTANCE)

A screen shot of a graph

Description automatically generated

CLOSE VIEW OF THE OUTPUTS (t=0-0.5 min)



## Verify the analytical results of (b) via simulation using the following steps

• Modify the basic EV model to include the following signals

A close-up of a car

Description automatically generated

A diagram of a computer program

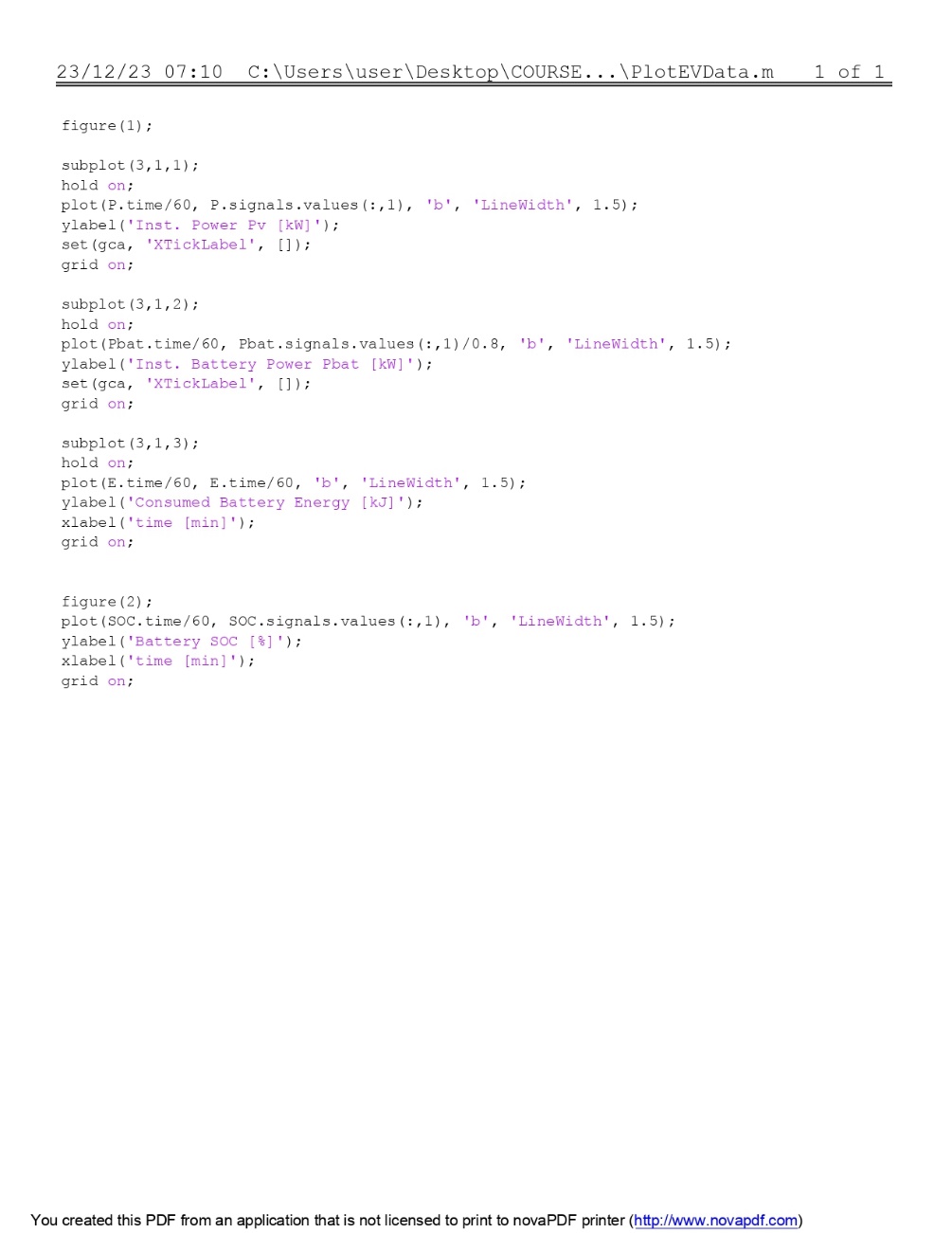
Description automatically generated

* Vehicle tractive power Pv
* Battery power, Pbatt = Pv / ηtw
* Total battery energy used, Ebatt (integral of battery power)

A screenshot of a computer

Description automatically generated

• Modify the PlotEVData.m file to add two additional subplots with the signals



* Pv and Pbatt
* Ebatt

GRAPH 1: Pv GRAPH 2: Pbat GRAPH 3: Ebat

A screenshot of a computer

Description automatically generated

BATTERY SOC

A graph showing a line

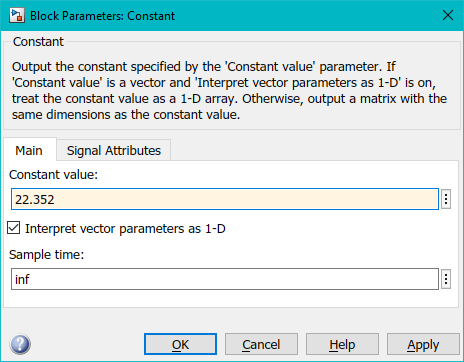
Description automatically generated with medium confidence

# System Simulation of Leaf-Sized Electric Vehicle

For the vehicle cruising in steady-state with velocity Vcruise = 50 mph on a flat road,

A screenshot of a computer

Description automatically generated



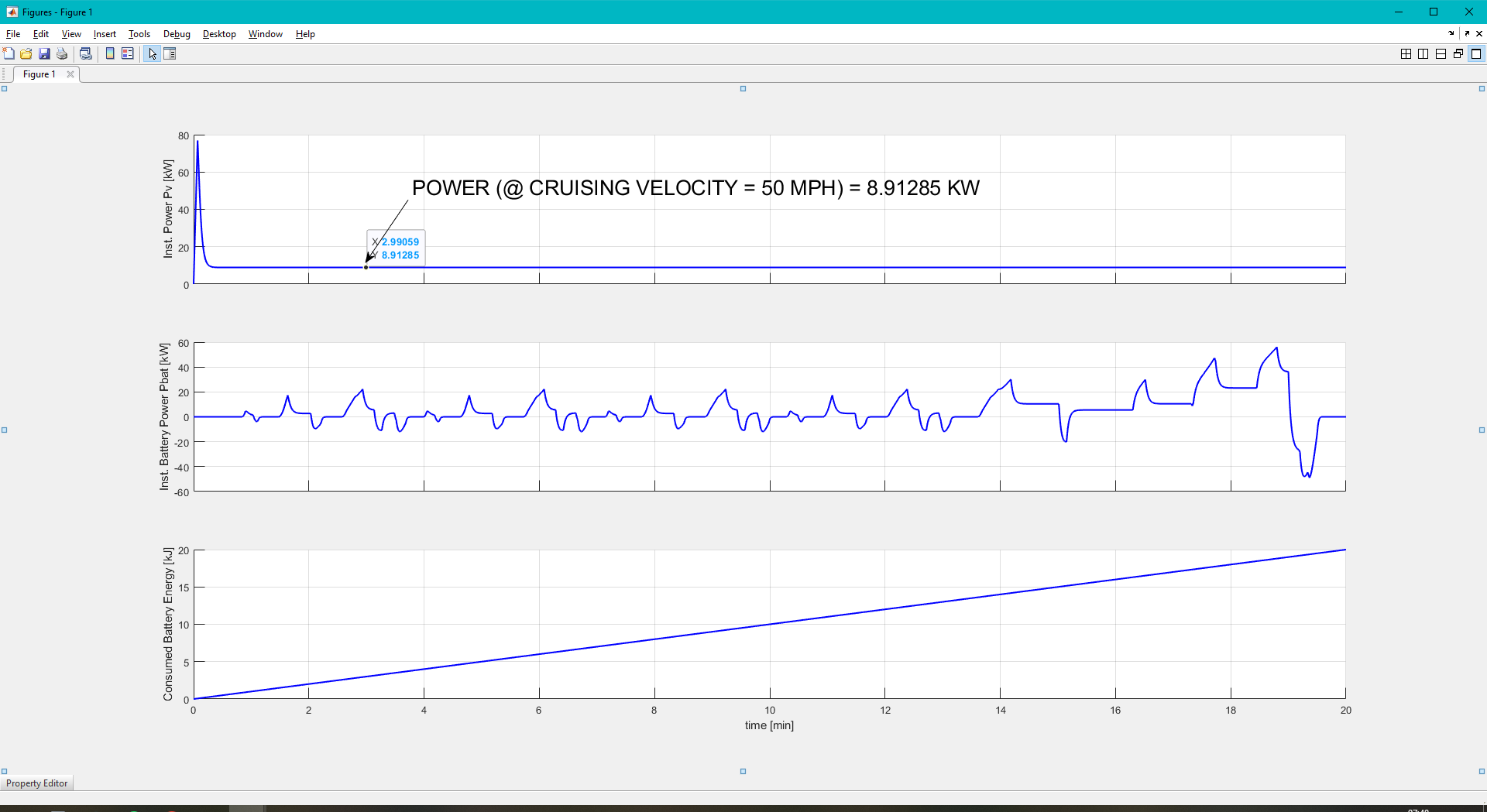
A close-up of a car

Description automatically generated

A diagram of a computer program

Description automatically generated

* Calculate the vehicle power Pv required to maintain cruise velocity



## Run the driving cycle eudc with tstop=1200 at two gear ratios, gratio = 7.94 and version from (a).

A screenshot of a computer

Description automatically generated

* Measure and report the total energy taken from the battery over the course of the entire driving cycle with your optimal gratio
* Compare the two gear ratios in terms of ending SOC and MPGe

A screenshot of a computer

Description automatically generated

GEAR RATIO=7.94

Ebatt SOC MPGe

A screenshot of a computer

Description automatically generated

* Turn in the plots of the motor torque Tm vs angular speed ωm path of the vehicle over the drive cycle overlaid on the motor efficiency contours

GEAR RATIO = 7.94

