Table of Contents


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%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% ENGR 132
% Program Description
% Using the data for the diesel model and jetfuel model find the
 linearized
% graph of each model. Then find the best fit equations to answer the
 given
% questions.
%
% Assigment Information
%   Assignment:     PS 05, Problem 2
%   Author:         Ranjan Behl, rbehl@purdue.edu
%   Team ID:        008-14
%   Contributor:    Name, login@purdue [repeat for each]
%   My contributor(s) helped me:
%     [ ] understand the assignment expectations without
%         telling me how they will approach it.
%     [ ] understand different ways to think about a solution
%         without helping me plan my solution.
%     [ ] think through the meaning of a specific error or
%         bug present in my code without looking at my code.
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
```

INITIALIZATION

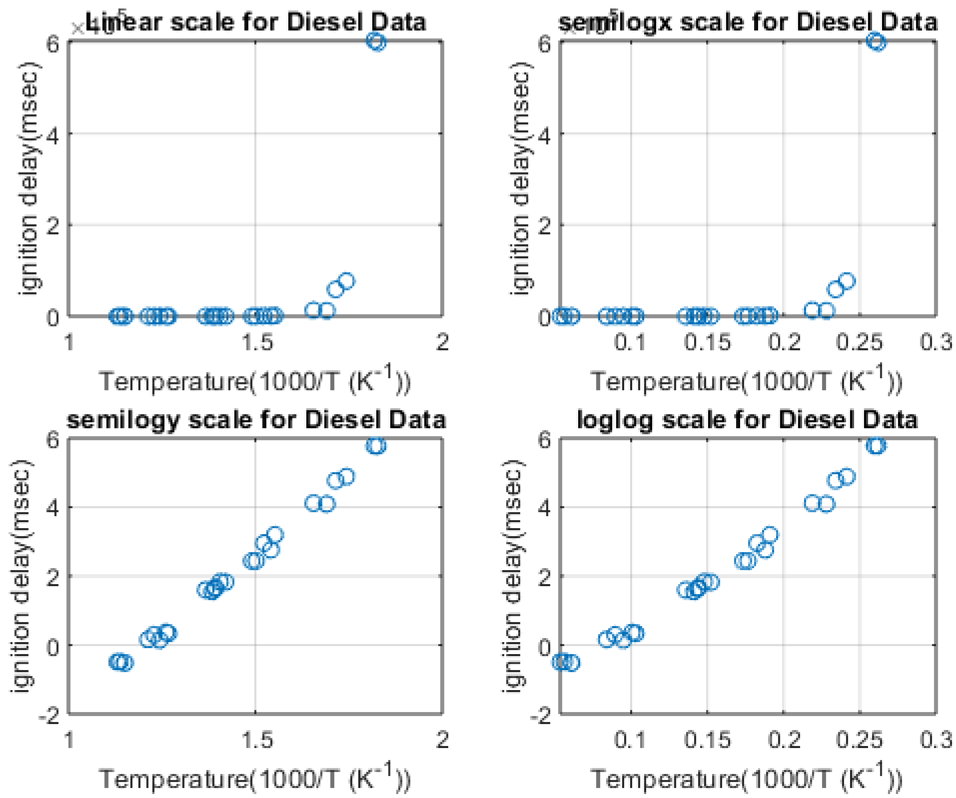
```
Datadiesel = csvread("Data_diesel_ignition_delay.csv",1,0); % loading
 the disel ignition data
Datajetfuel = csvread("Data_jetA_ignition_delay.csv",1,0);% loading
 the jet A ignition data
```

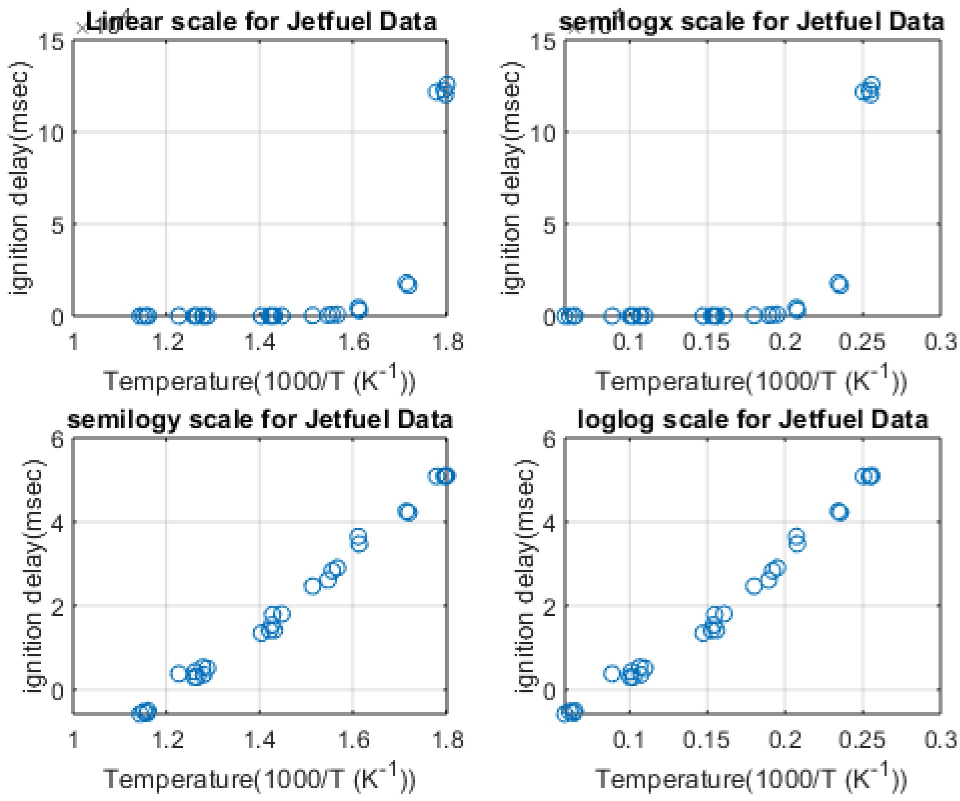
SUBPLOT FIGURE(S)

```
%Part A
figure (1)
subplot(2,2,1);
plot(Datadiesel(:,1),Datadiesel(:,2),'o'); % ploting the data on
 linear scale
grid on
hold on
title("Linear scale for Diesel Data"); % creating a title
xlabel("Temperature(1000/T (K^{-1}))"); % labeling the x axis
ylabel("ignition delay(msec)"); % labeling the y axis
%
subplot(2,2,2);
plot(log10(Datadiesel(:,1)),Datadiesel(:,2),'o'); % ploting the data
 on semilogx scale
grid on
title("semilogx scale for Diesel Data"); % creating a title
xlabel("Temperature(1000/T (K^{-1}))"); % labeling the x axis
ylabel("ignition delay(msec)"); % labeling the y axis
%
subplot(2,2,3);
plot(Datadiesel(:,1),log10(Datadiesel(:,2)),'o'); % ploting the data
 on semilogy scale
grid on
title("semilogy scale for Diesel Data"); % creating a title
xlabel("Temperature(1000/T (K^{-1}))"); % labeling the x axis
ylabel("ignition delay(msec)"); % labeling the y axis
%
subplot(2,2,4);
plot(log10(Datadiesel(:,1)),log10(Datadiesel(:,2)),'o'); % ploting the
 data on loglog scale
grid on
title("loglog scale for Diesel Data"); % creating a title
xlabel("Temperature(1000/T (K^{-1}))"); % labeling the x axis
ylabel("ignition delay(msec)"); % labeling the y axis

figure (2)
subplot(2,2,1);
plot(Datajetfuel(:,1),Datajetfuel(:,2),'o'); % ploting the data on
 linear scale
grid on
hold on
title("Linear scale for Jetfuel Data"); % creating a title
xlabel("Temperature(1000/T (K^{-1}))"); % labeling the x axis
ylabel("ignition delay(msec)"); % labeling the y axis
%
subplot(2,2,2);
plot(log10(Datajetfuel(:,1)),Datajetfuel(:,2),'o'); % ploting the data
 on semilogx scale
```

```
grid on
title("semilogx scale for Jetfuel Data"); % creating a title
xlabel("Temperature(1000/T (K^{-1}))"); % labeling the x axis
ylabel("ignition delay(msec)"); % labeling the y axis
%
subplot(2,2,3);
plot(Datajetfuel(:,1),log10(Datajetfuel(:,2)),'o'); % ploting the data on semilogy scale
grid on
title("semilogy scale for Jetfuel Data"); % creating a title
xlabel("Temperature(1000/T (K^{-1}))"); % labeling the x axis
ylabel("ignition delay(msec)"); % labeling the y axis
%
subplot(2,2,4);
plot(log10(Datajetfuel(:,1)),log10(Datajetfuel(:,2)),'o'); % ploting the data on loglog scale
grid on
title("loglog scale for Jetfuel Data"); % creating a title
xlabel("Temperature(1000/T (K^{-1}))"); % labeling the x axis
ylabel("ignition delay(msec)"); % labeling the y axis
```





LINEARIZATION

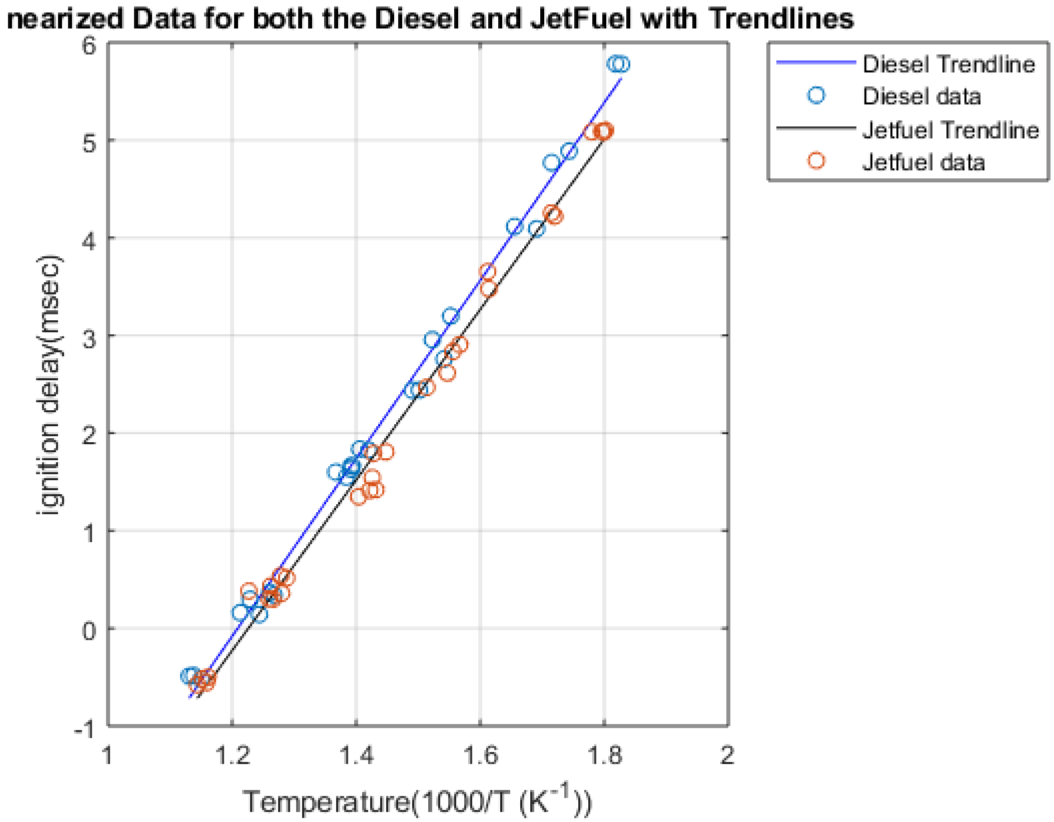
```
%Part C % D
coeffiecent_diesel =
 polyfit(Datadiesel(:,1),log10(Datadiesel(:,2)),1);% finding the slope
 and y int for the liearized eq
coeffiecent_jetfuel =
 polyfit(Datajetfuel(:,1),log10(Datajetfuel(:,2)),1);% finding the
 slope and y int for the liearized eq
linearizeddata_disel = polyval(coeffiecent_diesel,Datadiesel(:,1));%
 linearizing the diesel data
linearizedata_jetfuel =
 polyval(coeffiecent_jetfuel,Datajetfuel(:,1));% linearizing the
 jetfuel data
%Part e
fprintf("\nThe linearized form of the equation for the
 diesel model is Temperature = %f * ingitiondelay +
 %f",coeffiecent_diesel(1),coeffiecent_diesel(2));
fprintf(" \nThe linearized form of the equation for the
 jetfuel model is Temperature = %f * ingitiondelay +
 %f",coeffiecent_jetfuel(1),coeffiecent_jetfuel(2));
```

```
The linearized form of the equation for the diesel model is
 Temperature = 9.108982 * ingitiondelay + -11.012486
The linearized form of the equation for the jetfuel model is
 Temperature = 8.732472 * ingitiondelay + -10.706709
```

MODEL

```
figure (3)
plot(Datadiesel(:,1),linearizeddata_disel,'-b','DisplayName','Diesel
 Trendline'); % ploting the linearized data for diesel and its trend
 line
hold on
plot(Datadiesel(:,1),log10(Datadiesel(:,2)),'o','DisplayName','Diesel
 data');% ploting the diesel data
grid on
plot(Datajetfuel(:,1),linearizedata_jetfuel,'-
k','DisplayName','Jetfuel Trendline'); % ploting the linearized data
 for the jetfuel and its trend line
plot(Datajetfuel(:,1),log10(Datajetfuel(:,2)),'o','DisplayName','Jetfuel
 data'); % ploting the jetfuel data
xlabel("Temperature(1000/T (K^{-1}))"); % labeling the x axis
ylabel("ignition delay(msec)"); % labeling the y axis
title("Linearized Data for both the Diesel and JetFuel with
 Trendlines")
legend('Location','northeastoutside')
%Part g
genform_dieseleq = 10.^(((coeffiecent_diesel(1) * Datadiesel(:,1)) +
 coeffiecent_diesel(2)));% finding the general form of the best fit
 equation for the diesel model
genform_jetfueleq = 10.^(((coeffiecent_jetfuel(1) * Datajetfuel(:,1))
 + coeffiecent_jetfuel(2)));% finding the general form of the best fit
 equation for the jetfuel model
%Part h
fprintf("\nThe general form of of the best fit equation for
 the Diesel model is Temperature = 10^ingitiondelay * %.3f +
 %.3f",coeffiecent_diesel(1),coeffiecent_diesel(2));
fprintf("\nThe general form of of the best fit equation for
 the Jetfuel model is Temperature = 10^ingitiondelay * %.3f +
 %.3f",coeffiecent_jetfuel(1),coeffiecent_jetfuel(2));
```

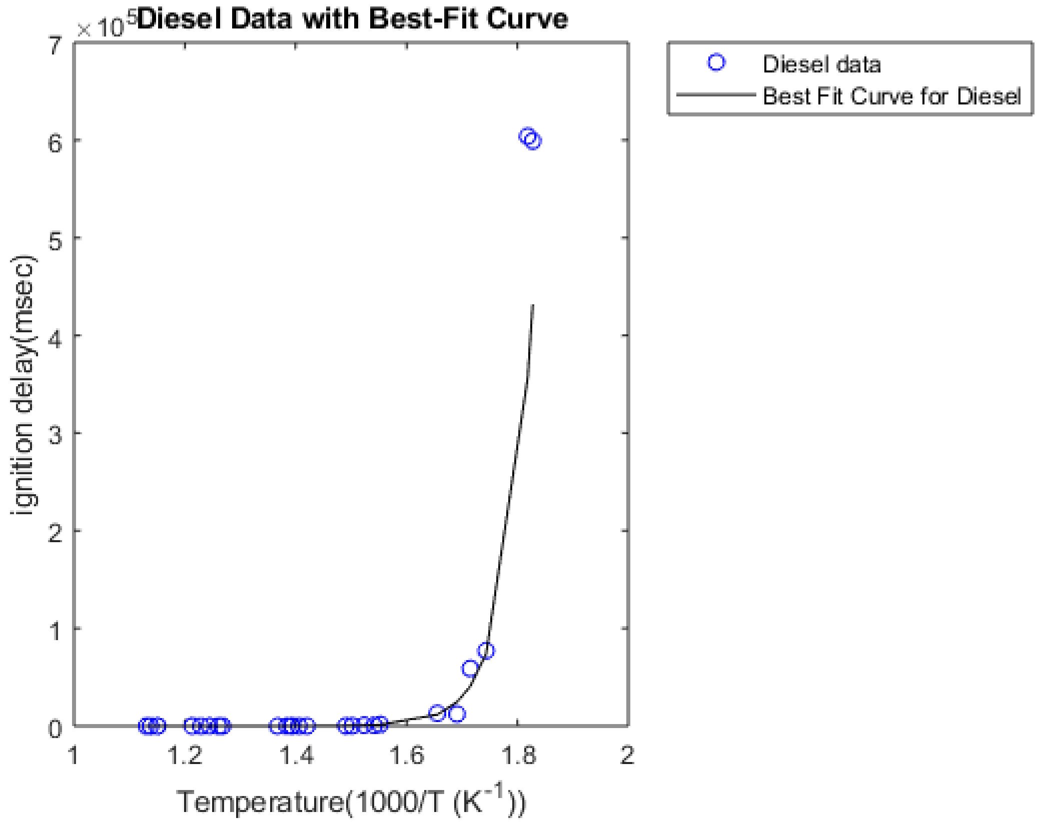
```
The general form of of the best fit equation for the Diesel model is
 Temperature = 10^ingitiondelay * 9.109 + -11.012
The general form of of the best fit equation for the Jetfuel model is
 Temperature = 10^ingitiondelay * 8.732 + -10.707
```

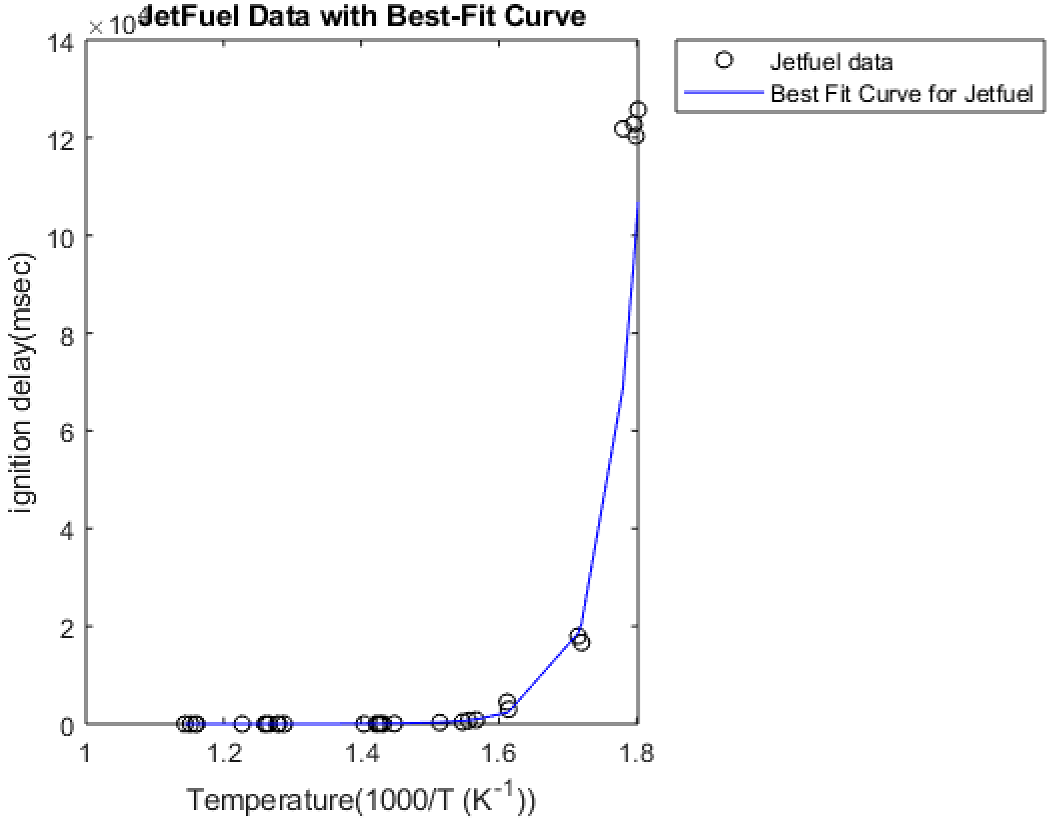


UPDATED PLOTS

```
figure (4)
plot(Datadiesel(:,1),(Datadiesel(:,2)),'bo','DisplayName','Diesel
 data'); % ploting the data on semilogy scale
hold on
plot(Datadiesel(:,1),genform_dieseleq,'-k','DisplayName','Best Fit
 Curve for Diesel');%ploting the best fit curve for the diesel model
hold off
xlabel("Temperature(1000/T (K^{-1}))"); % labeling the x axis
ylabel("ignition delay(msec)"); % labeling the y axis
title("Diesel Data with Best-Fit Curve")
legend('Location','northeastoutside')
figure (5)
plot(Datajetfuel(:,1),(Datajetfuel(:,2)),'ko','DisplayName','Jetfuel
 data'); % ploting the data on semilogy scale
hold on
plot(Datajetfuel(:,1),genform_jetfueleq,'-b','DisplayName','Best Fit
 Curve for Jetfuel'); % ploting the best fit curve for the jetfuel
 model
hold off
xlabel("Temperature(1000/T (K^{-1}))"); % labeling the x axis
ylabel("ignition delay(msec)"); % labeling the y axis
```

```
title("JetFuel Data with Best-Fit Curve")
legend('Location','northeastoutside')
```





ANALYSIS

-- Q1

For both the Diesel and Jetfuel data the exponential function is the one that best represents the data. This can be seen by the subplots in each figure where the semilogy scale is the one with the most linearized data trend.

ACADEMIC INTEGRITY STATEMENT

I have not used source code obtained from any other unauthorized source, either modified or unmodified. Neither have I provided access to my code to another. The script I am submitting is my own original work.

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