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Lab 02

Introduction to lathe Machine perform straight turning and calculate machining time.

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1. Plot a relationship between RPMs and Cutting speed.
2. Plot a relationship between RPMs and Feed.
3. Plot a relationship between RPMs and Machining time.
4. Plot a relationship between RPMs and Actual time.
5. Plot a relationship between machining time and actual time.

MATLAB Code

```
% Lab 02: Introduction to Lathe Machine - Straight Turning
% Student: Barira Qasim (F2022031016)

% Given Data
RPM = [660, 660, 660, 660, 660, 660, 660]; % rev/min
Cutting_Speed = [51836, 47689, 45616, 89366, 60545, 76510, 73815]; % mm/min
Feed = [0.0910, 0.0910, 0.0910, 0.0910, 0.0910, 0.0910, 0.0910]; % mm/rev
Machining_Time = [0.87, 0.83, 0.82, 0.80, 0.75, 0.67, 0.65]; % seconds
Actual_Time = [23.07, 23.37, 22.19, 24.02, 22.87, 24.26, 24.02]; % seconds

% 1. Plot: RPMs vs Cutting Speed
figure;
plot(RPM, Cutting_Speed, '-o', 'LineWidth', 2);
xlabel('RPM (rev/min)');
ylabel('Cutting Speed (mm/min)');
title('Lab 02: RPM vs Cutting Speed (Barira Qasim - F2022031016)');
legend('Cutting Speed vs RPM');
grid on;

% 2. Plot: RPMs vs Feed
figure;
plot(RPM, Feed, '-s', 'LineWidth', 2);
xlabel('RPM (rev/min)');
ylabel('Feed (mm/rev)');
title('Lab 02: RPM vs Feed (Barira Qasim - F2022031016)');
legend('Feed vs RPM');
grid on;

% 3. Plot: RPMs vs Machining Time
figure;
plot(RPM, Machining_Time, '-d', 'LineWidth', 2);
xlabel('RPM (rev/min)');
ylabel('Machining Time (seconds)');
title('Lab 02: RPM vs Machining Time (Barira Qasim - F2022031016)');
legend('Machining Time vs RPM');
grid on;

% 4. Plot: RPMs vs Actual Time
figure;
plot(RPM, Actual_Time, '-x', 'LineWidth', 2);
xlabel('RPM (rev/min)');
```

```
ylabel('Actual Time (seconds)');
title('Lab 02: RPM vs Actual Time (Barira Qasim - F2022031016)');
legend('Actual Time vs RPM');
grid on;

% 5. Plot: Machining Time vs Actual Time
figure;
plot(Machining_Time, Actual_Time, '-*', 'LineWidth', 2);
xlabel('Machining Time (seconds)');
ylabel('Actual Time (seconds)');
title('Lab 02: Machining Time vs Actual Time (Barira Qasim - F2022031016)');
legend('Actual Time vs Machining Time');
grid on;
```
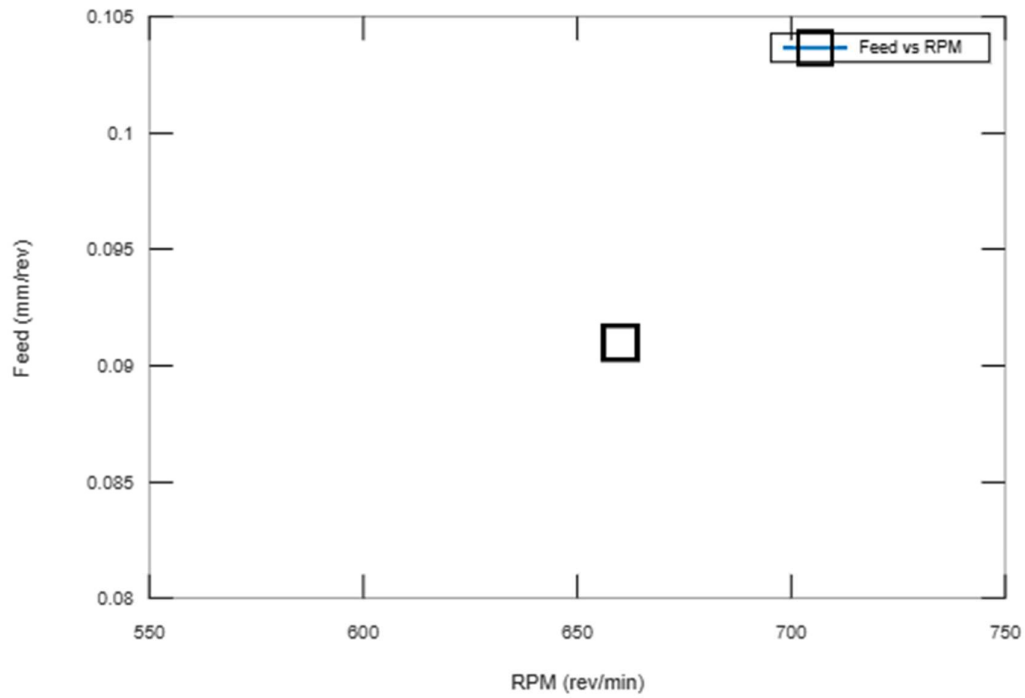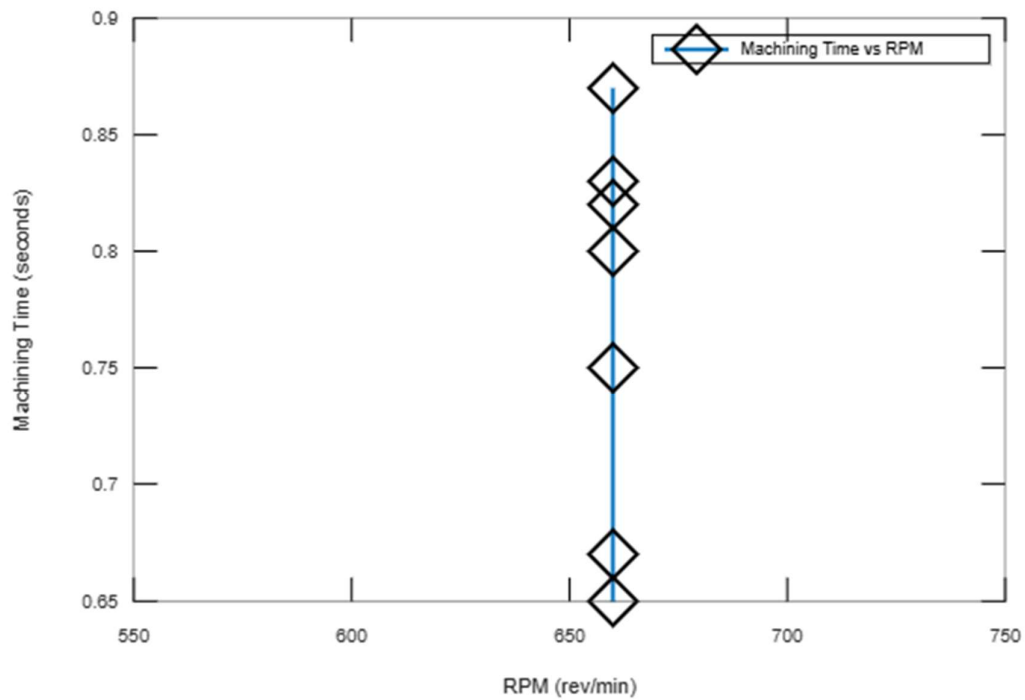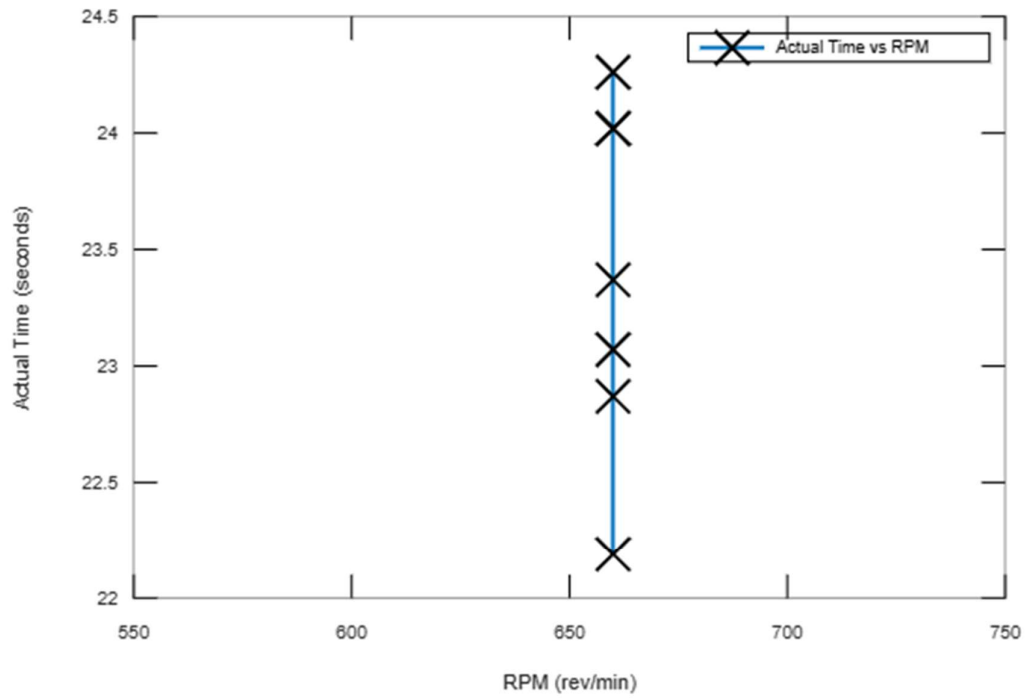
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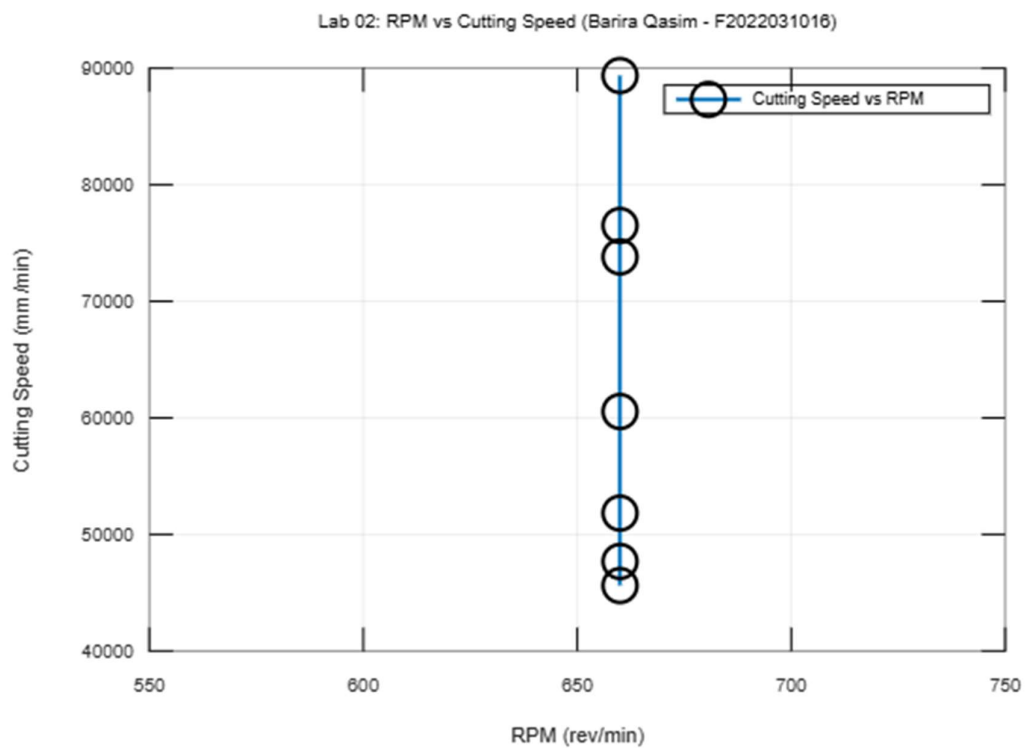
Lab 02: RPM vs Feed (Barira Qasim - F2022031016)
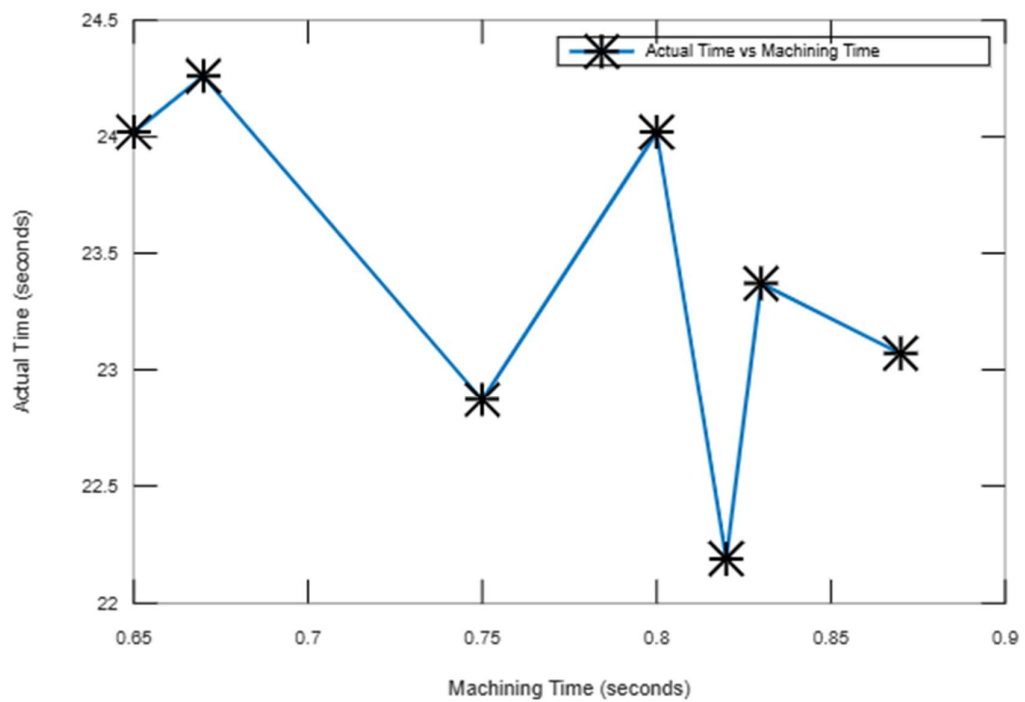

Lab 02: RPM vs Machining Time (Barira Qasim - F2022031016)

Lab 02: RPM vs Actual Time (Barira Qasim - F2022031016)

Lab 02: Machining Time vs Actual Time (Barira Qasim - F2022031016)

Comments

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Lab 04

Perform facing operation on MS rod to calculate machining time and material removal rate (MRR).

Plots

1. Plot a relationship between RPMs and cutting speed.
2. Plot a relationship between RPMs and feed.
3. Plot a relationship between RPMs and machining time.
4. Plot a relationship between RPMs and actual machining time.
5. Pot a relationship between machining time and actual machining time.
6. Plot a relationship between RPMs and material removal rate.

MATLAB Code

```
% Lab 04: Facing Operation on MS Rods

% Student: Barira Qasim (F2022031016)


% Given Data

RPM = [660, 660, 660, 660]; % rev/min (constant for all)

Cutting_Speed = [78376, 76303, 74230, 72156]; % mm/min

Feed = [0.018, 0.018, 0.018, 0.018]; % mm/rev (constant for all)

Machining_Time = [1.10, 1.90, 1.50, 2.20]; % minutes

Actual_Time = [66.00/60, 114.00/60, 90.00/60, 132.00/60]; % minutes (converted from seconds)

Depth_of_Cut = [1, 1, 1, 1]; % mm (constant for all)


% 1. Plot: RPMs vs Cutting Speed

figure;

plot(RPM, Cutting_Speed, '-o', 'LineWidth', 2);

xlabel('RPM (rev/min)');

ylabel('Cutting Speed (mm/min)');

title('Lab 04: RPM vs Cutting Speed (Barira Qasim - F2022031016)');

legend('Cutting Speed vs RPM');

grid on;
```

```
% 2. Plot: RPMs vs Feed

figure;

plot(RPM, Feed, '-s', 'LineWidth', 2);

xlabel('RPM (rev/min)');

ylabel('Feed (mm/rev)');

title('Lab 04: RPM vs Feed (Barira Qasim - F2022031016)');

legend('Feed vs RPM');

grid on;


% 3. Plot: RPMs vs Machining Time

figure;

plot(RPM, Machining_Time, '-d', 'LineWidth', 2);

xlabel('RPM (rev/min)');

ylabel('Machining Time (minutes)');

title('Lab 04: RPM vs Machining Time (Barira Qasim - F2022031016)');

legend('Machining Time vs RPM');

grid on;


% 4. Plot: RPMs vs Actual Time

figure;

plot(RPM, Actual_Time, '-x', 'LineWidth', 2);

xlabel('RPM (rev/min)');

ylabel('Actual Time (minutes)');

title('Lab 04: RPM vs Actual Time (Barira Qasim - F2022031016)');

legend('Actual Time vs RPM');

grid on;


% 5. Plot: Machining Time vs Actual Time

figure;

plot(Machining_Time, Actual_Time, '-*', 'LineWidth', 2);

xlabel('Machining Time (minutes)');
```

ylabel('Actual Time (minutes)');

title('Lab 04: Machining Time vs Actual Time (Barira Qasim - F2022031016)');

legend('Actual Time vs Machining Time');

grid on;

% 6. Plot: RPMs vs Material Removal Rate

MRR = pi .* [37.80, 36.80, 35.80, 34.80] .* Depth_of_Cut .* Feed; % MRR in mm^3/min

figure;

plot(RPM, MRR, '-^', 'LineWidth', 2);

xlabel('RPM (rev/min)');

ylabel('Material Removal Rate (mm^3/min)');

title('Lab 04: RPM vs Material Removal Rate (Barira Qasim - F2022031016)');

legend('Material Removal Rate vs RPM');

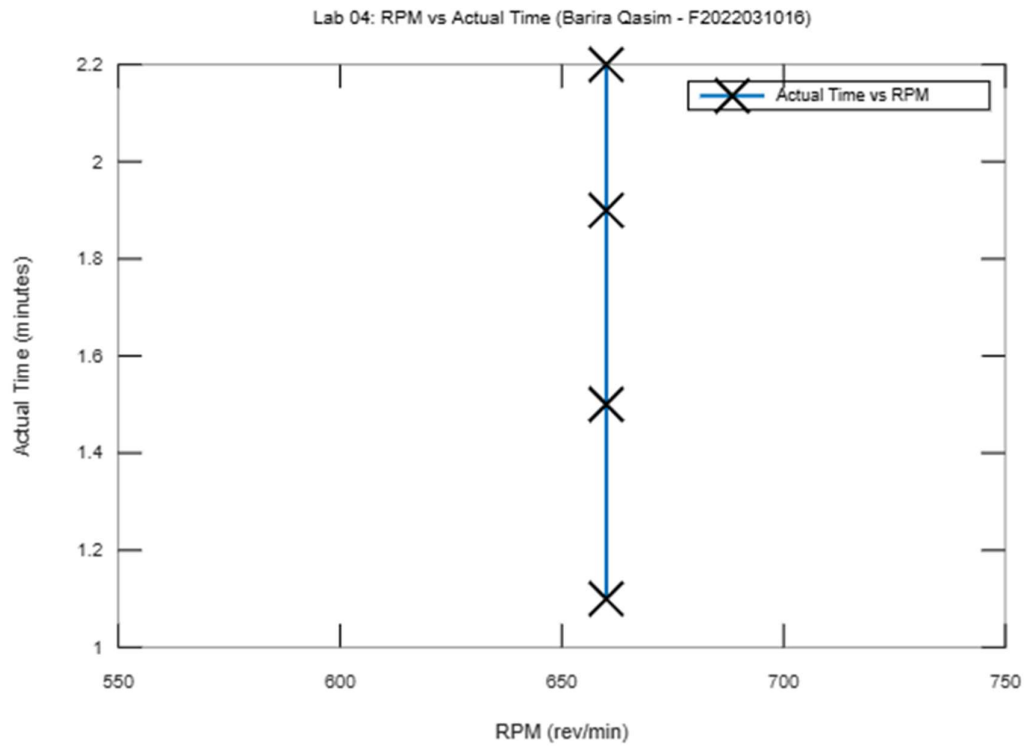grid on;

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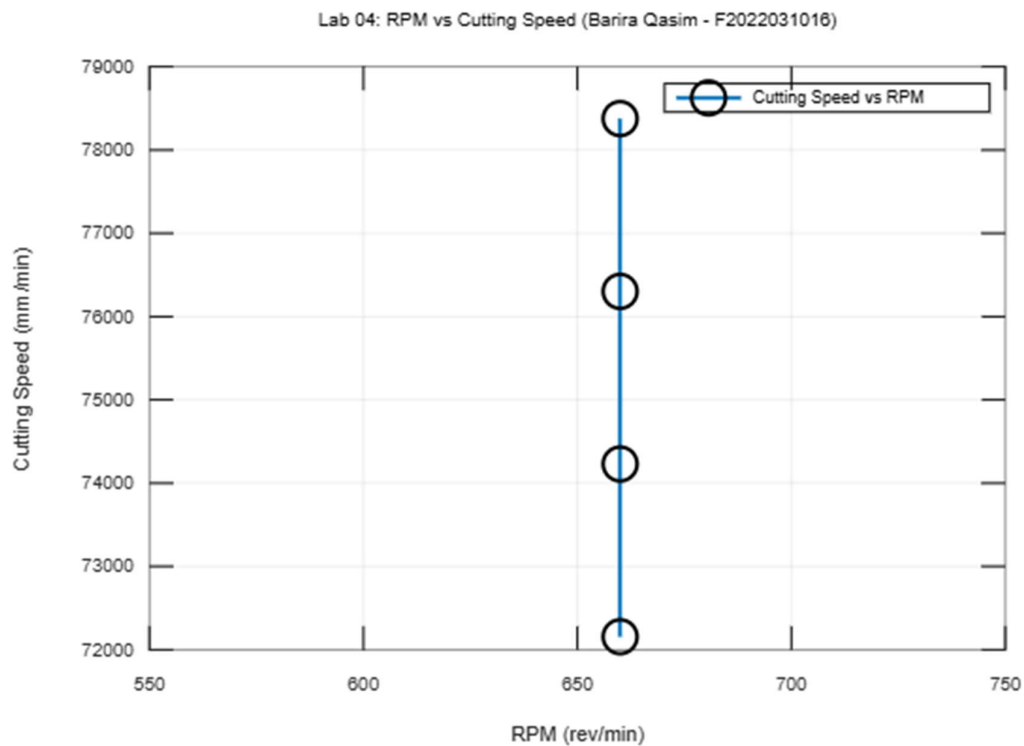
Lab 04: RPM vs Cutting Speed (Barira Qasim - F2022031016)

Lab 04: RPM vs Feed (Barira Qasim - F2022031016)

Lab 04: RPM vs Machining Time (Barira Qasim - F2022031016)

Lab 04: RPM vs Actual Time (Barira Qasim - F2022031016)

Lab 04: Machining Time vs Actual Time (Barira Qasim - F2022031016)
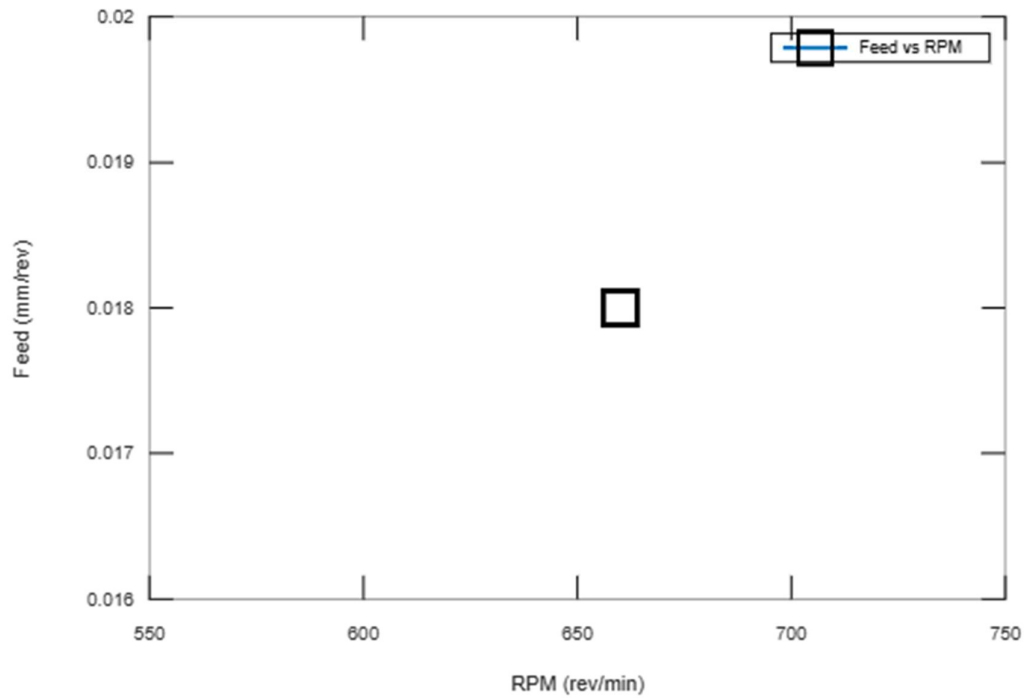
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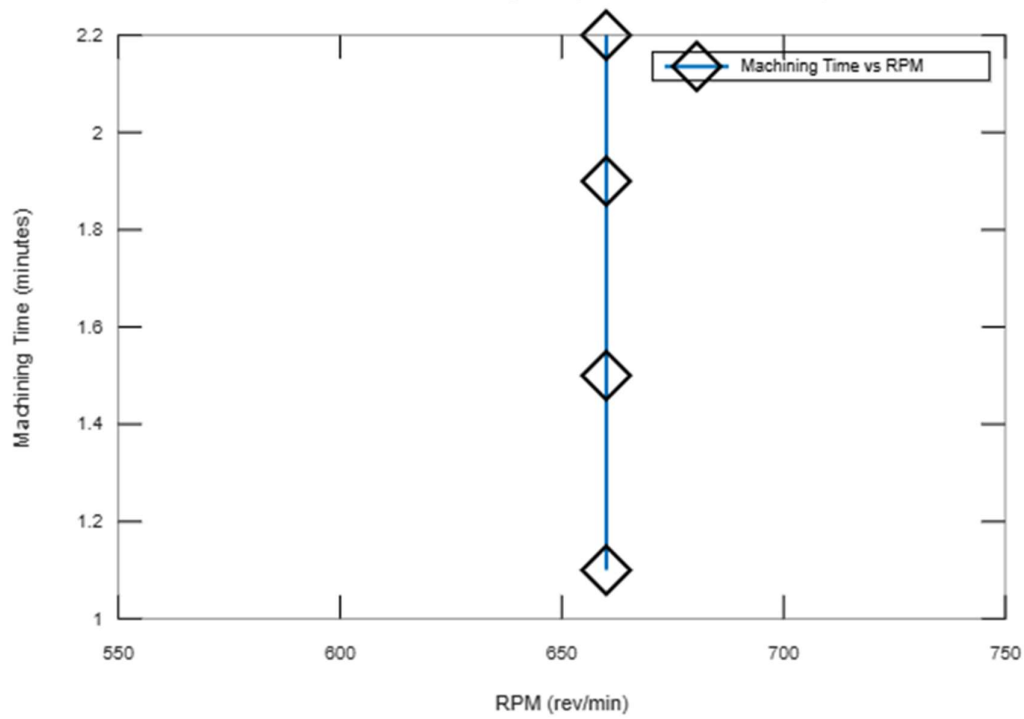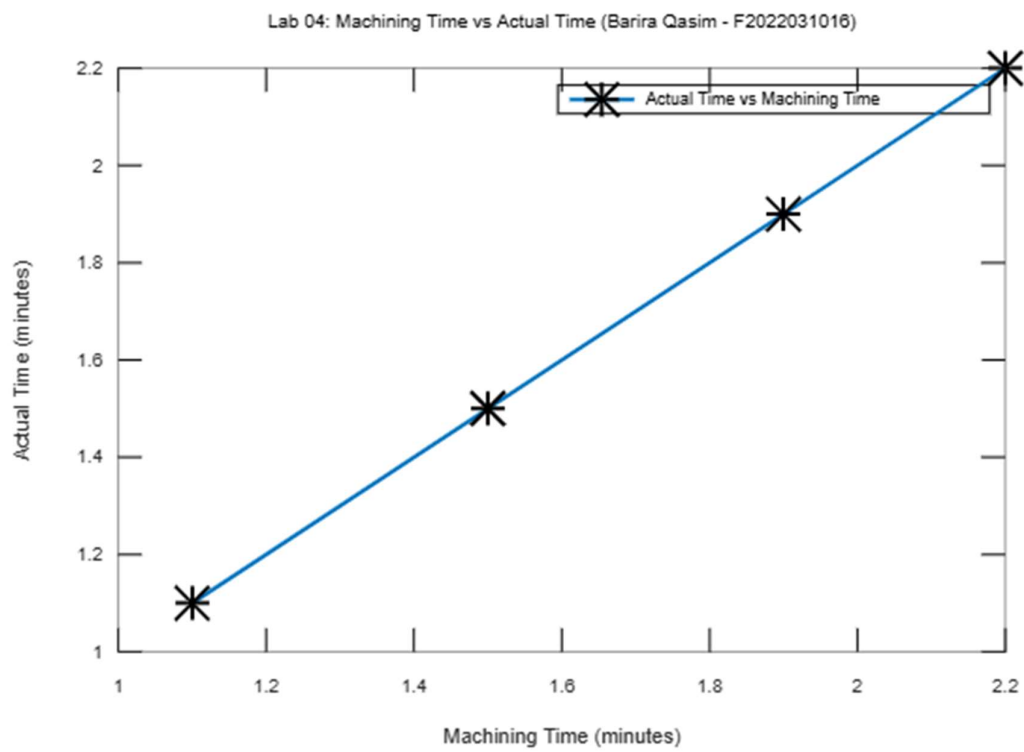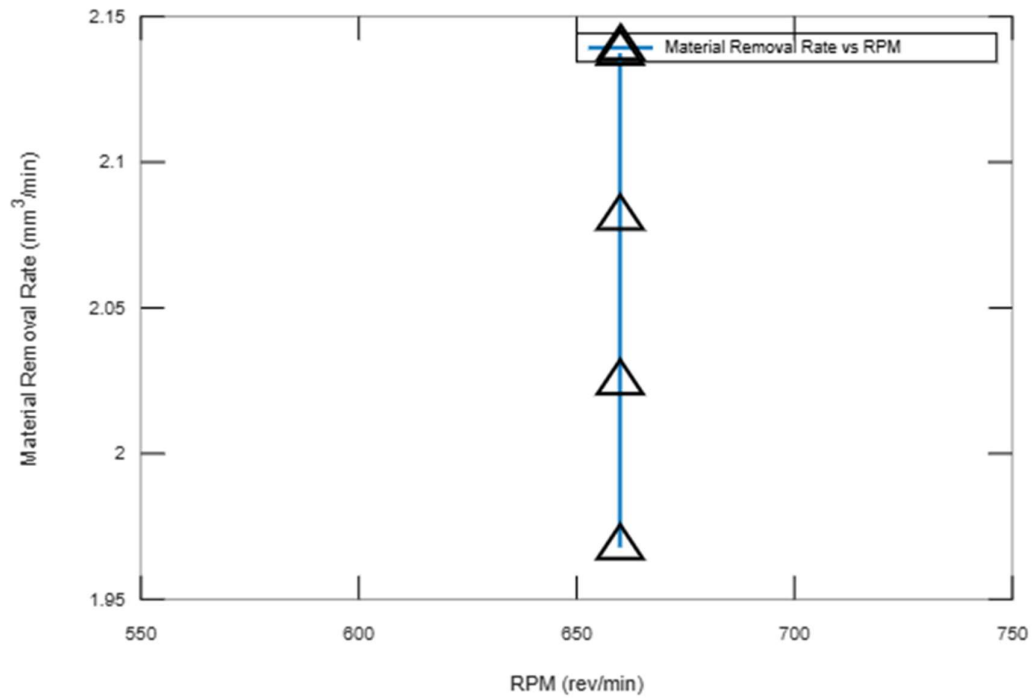
Comments:

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Lab 07

Perform facing operation on shape machine to calculate machining time.

Plots

1. Plot a relationship between feed and cutting speed.
2. Plot a relationship between cutting speed and theoretical machining time.
3. Plot a relationship between cutting speed and actual machining time.
4. Plot a relationship between actual and theoretical machining time.

MATLAB CODE:

```
% Lab 07: Facing Operation on Shaper Machine

% Student: Barira Qasim (F2022031016)


% Given Data

Length_Workpiece = [86, 83.0, 79.0]; % mm

Width_Workpiece = [30, 28.0, 25.0]; % mm

Clearance_Length = [142, 139, 135]; % mm

No_of_Stroke_per_min = [60, 60, 60]; % strokes/min

Feed_per_stroke = [0.3, 0.3, 0.3]; % mm/stroke (constant for all)

Cutting_Speed = [14200, 13900, 13500]; % mm/min

Thickness_initial = [21.3, 20.0, 19.3]; % mm

Depth_of_cut = [0.5, 0.5, 0.5]; % mm (constant for all)

Thickness_final = [20.8, 19.5, 18.8]; % mm

Number_of_Passes = [1, 1, 1]; % number of passes

Theoretical_Machining_Time = [1.67, 1.56, 1.39]; % min

Actual_Machining_Time_sec = [140, 160, 155]; % seconds


% Convert Actual Machining Time to minutes

Actual_Machining_Time = Actual_Machining_Time_sec / 60; % min


% Calculate Percentage Difference
```

```matlab
Percent_Difference = ((Actual_Machining_Time - Theoretical_Machining_Time) ./ Theoretical_Machining_Time) * 100;


% Plotting Relationships


% 1. Plot: Feed vs Cutting Speed

figure;

plot(Feed_per_stroke, Cutting_Speed, '-o', 'LineWidth', 2);

xlabel('Feed (mm/stroke)');

ylabel('Cutting Speed (mm/min)');

title('Lab 07: Feed vs Cutting Speed (Barira Qasim - F2022031016)');

legend('Feed vs Speed');

grid on;


% 2. Plot: Cutting Speed vs Theoretical Machining Time

figure;

plot(Cutting_Speed, Theoretical_Machining_Time, '-s', 'LineWidth', 2);

xlabel('Cutting Speed (mm/min)');

ylabel('Theoretical Time (min)');

title('Lab 07: Speed vs Theoretical Time (Barira Qasim - F2022031016)');

legend('Speed vs Tm');

grid on;


% 3. Plot: Cutting Speed vs Actual Machining Time

figure;

plot(Cutting_Speed, Actual_Machining_Time, '-d', 'LineWidth', 2);

xlabel('Cutting Speed (mm/min)');

ylabel('Actual Time (min)');

title('Lab 07: Speed vs Actual Time (Barira Qasim - F2022031016)');

legend('Speed vs Ta');

grid on;
```

```
% 4. Plot: Actual vs Theoretical Machining Time

figure;

plot(Theoretical_Machining_Time, Actual_Machining_Time, '-*', 'LineWidth', 2);

xlabel('Theoretical Time (min)');

ylabel('Actual Time (min)');

title('Lab 07: Actual vs Theoretical Time (Barira Qasim - F2022031016)');

legend('Ta vs Tm');

grid on;


% Optional: Display Percentage Difference in Command Window

disp('Percentage Difference between Actual and Theoretical Machining Times:');

disp(Percent_Difference);
```
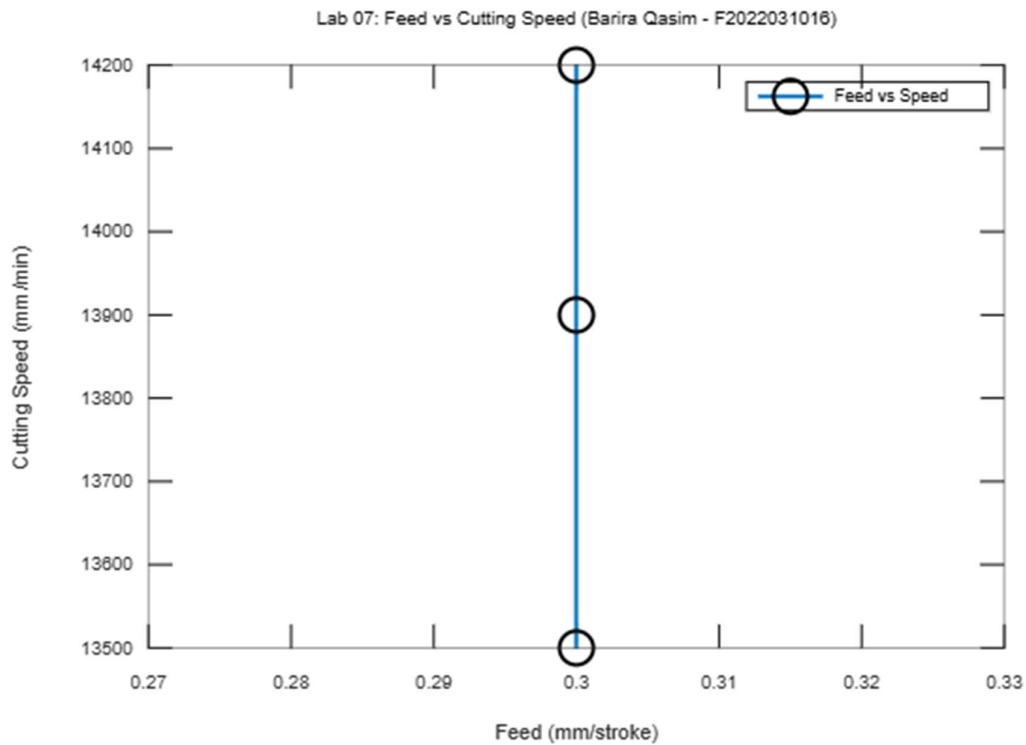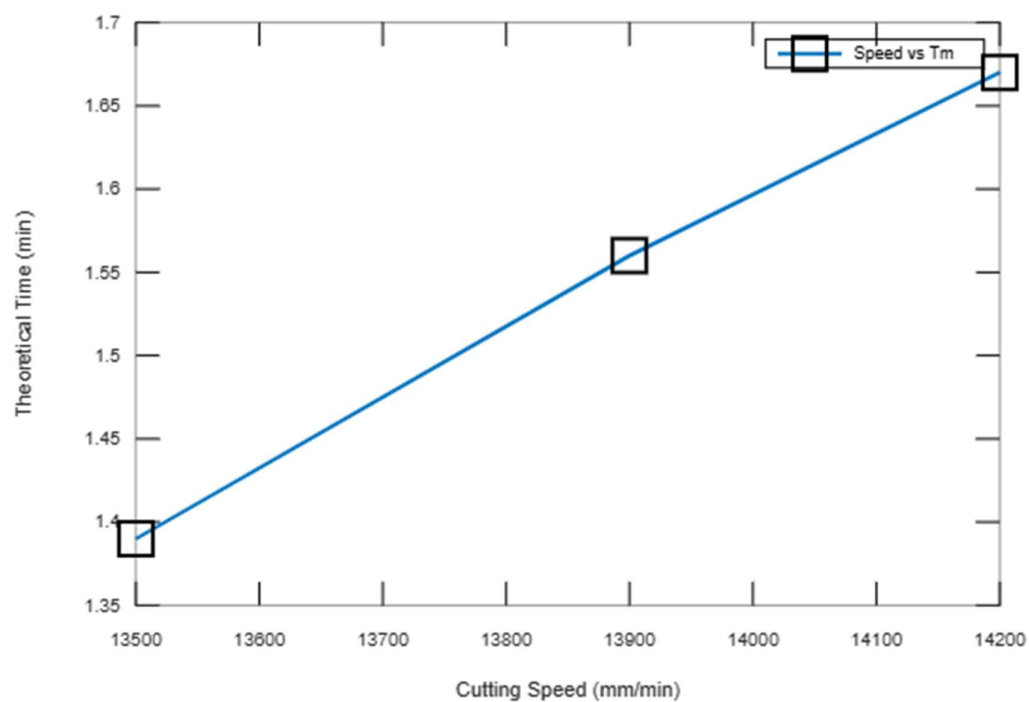
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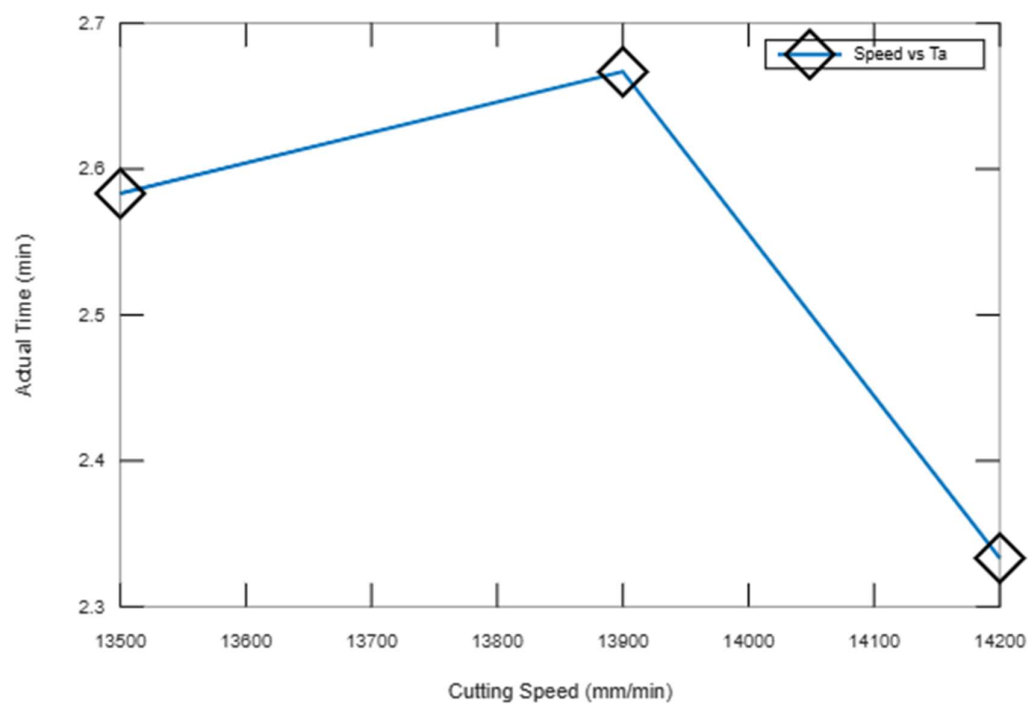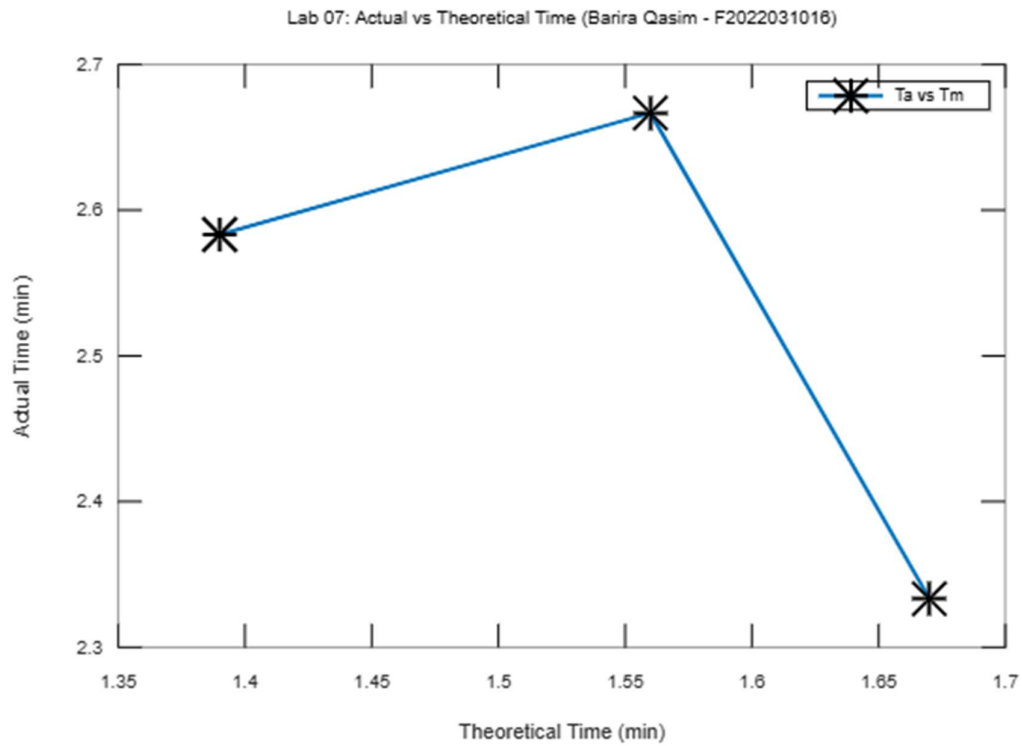
Lab 07: Feed vs Cutting Speed (Barira Qasim - F2022031016)

Lab 07: Speed vs Theoretical Time (Barira Qasim - F2022031016)

Lab 07: Speed vs Actual Time (Barira Qasim - F2022031016)

Lab 07: Actual vs Theoretical Time (Barira Qasim - F2022031016)

Comments:

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Lab 09

Introduction to milling machine and perform face milling to calculate machining time.

Plot

1. Plot a relationship between RPM and cutting speed.
2. Plot a relationship between RPM and feed rate.
3. Plot a relationship between cutting speed and feed rate.
4. Plot a relationship between actual and theoretical machining time.
5. Plot a relationship between theoretical machining time and feed rate.
6. Plot a relationship between actual machining time and feed rate.

MATLAB CODE:

```
% Lab 09: Introduction to Milling Machine

% Student: Barira Qasim (F2022031016)


% Given Data

L = 95; % Length of workpiece in mm

w = 50; % Width of workpiece in mm

D = 8; % Diameter of tool in mm

n_t = 4; % Number of teeth

LC = 4; % Approach and Overtravel length in mm

feed_per_tooth = 8; % Feed per tooth in mm/rev

RPM = [450, 450, 450]; % RPM values for each case


% Calculating Cutting Speed and Feed Rate

cutting_speed = pi * D * RPM; % Cutting Speed Vc in mm/min

feed_rate = feed_per_tooth * n_t .* RPM; % Feed rate fr in mm/min


% Theoretical Machining Time Calculation

T_theoretical = (L + LC) ./ feed_rate; % Theoretical Machining Time in min


% Actual Machining Times (converted from seconds to minutes)
```

```matlab
T_actual_sec = [39, 22, 29]; % Actual machining times in seconds

T_actual = T_actual_sec / 60; % Convert to minutes


% Plotting Relationships


% 1. Plot: RPM vs Cutting Speed

figure;

plot(RPM, cutting_speed, '-o', 'LineWidth', 2);

xlabel('RPM (rev/min)');

ylabel('Cutting Speed (mm/min)');

title('Lab 09: RPM vs Cutting Speed (Barira Qasim - F2022031016)');

legend('Cutting Speed vs RPM');

grid on;


% 2. Plot: RPM vs Feed Rate

figure;

plot(RPM, feed_rate, '-s', 'LineWidth', 2);

xlabel('RPM (rev/min)');

ylabel('Feed Rate (mm/min)');

title('Lab 09: RPM vs Feed Rate (Barira Qasim - F2022031016)');

legend('Feed Rate vs RPM');

grid on;


% 3. Plot: Cutting Speed vs Feed Rate

figure;

plot(cutting_speed, feed_rate, '-d', 'LineWidth', 2);

xlabel('Cutting Speed (mm/min)');

ylabel('Feed Rate (mm/min)');

title('Lab 09: Cutting Speed vs Feed Rate (Barira Qasim - F2022031016)');

legend('Feed Rate vs Cutting Speed');

grid on;
```

```matlab
% 4. Plot: Actual vs Theoretical Machining Time
figure;
plot(T_theoretical, T_actual, '-*', 'LineWidth', 2);
xlabel('Theoretical Machining Time (min)');
ylabel('Actual Machining Time (min)');
title('Lab 09: Actual vs Theoretical Machining Time (Barira Qasim - F2022031016)');
legend('Actual Time vs Theoretical Time');
grid on;


% 5. Plot: Theoretical Machining Time vs Feed Rate
figure;
plot(feed_rate, T_theoretical, '-^', 'LineWidth', 2);
xlabel('Feed Rate (mm/min)');
ylabel('Theoretical Machining Time (min)');
title('Lab 09: Feed Rate vs Theoretical Machining Time (Barira Qasim - F2022031016)');
legend('Theoretical Time vs Feed Rate');
grid on;


% 6. Plot: Actual Machining Time vs Feed Rate
figure;
plot(feed_rate, T_actual, '-x', 'LineWidth', 2);
xlabel('Feed Rate (mm/min)');
ylabel('Actual Machining Time (min)');
title('Lab 09: Feed Rate vs Actual Machining Time (Barira Qasim - F2022031016)');
legend('Actual Time vs Feed Rate');
grid on;
```
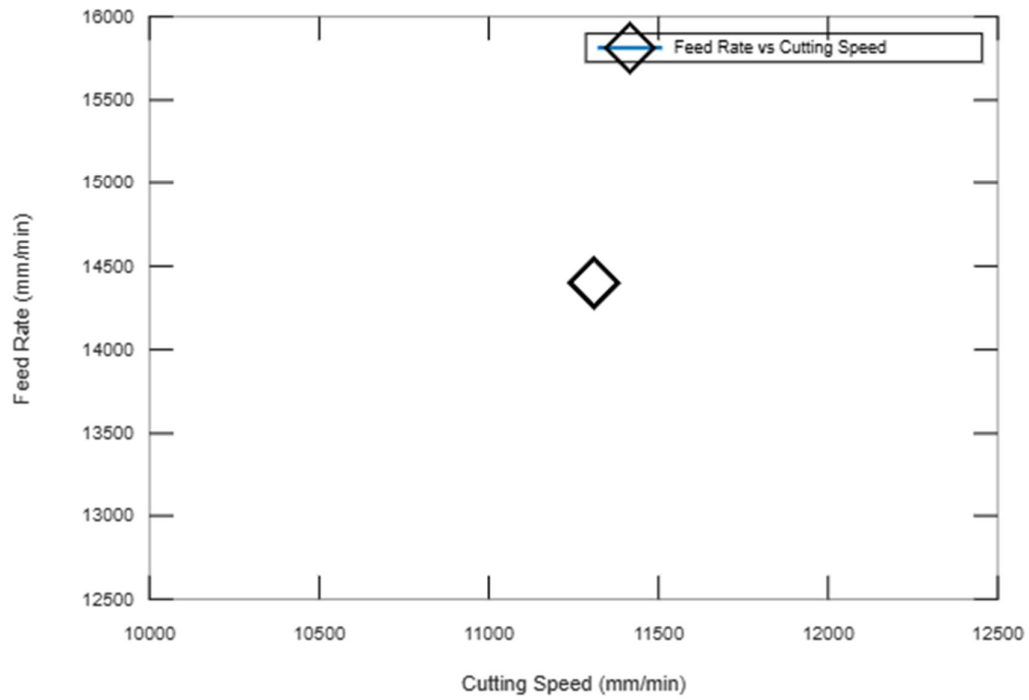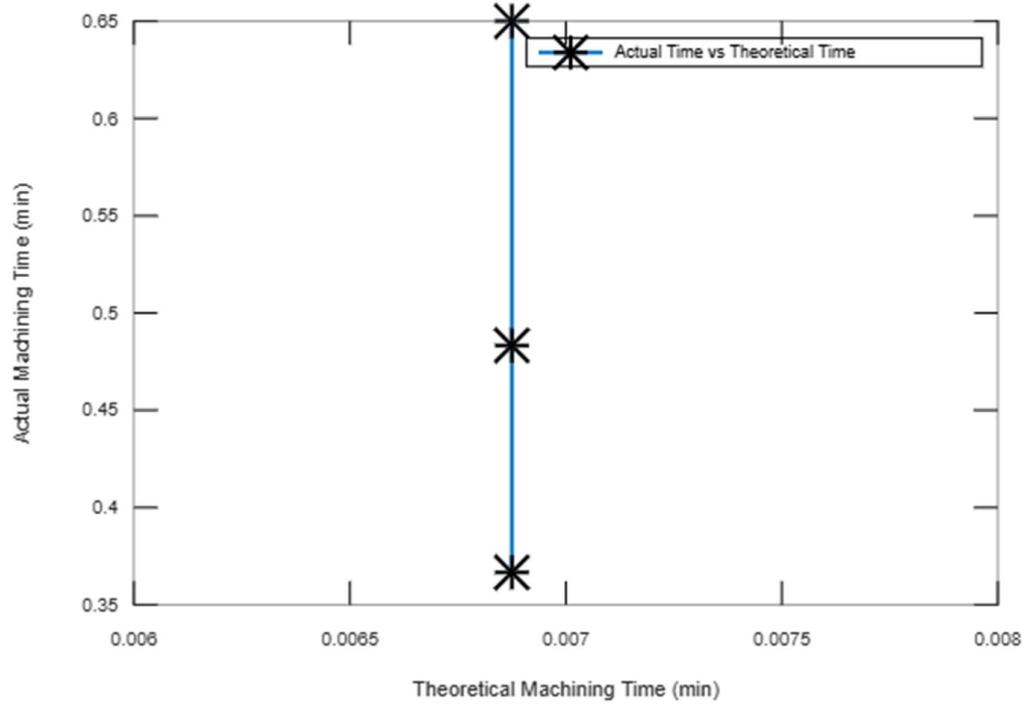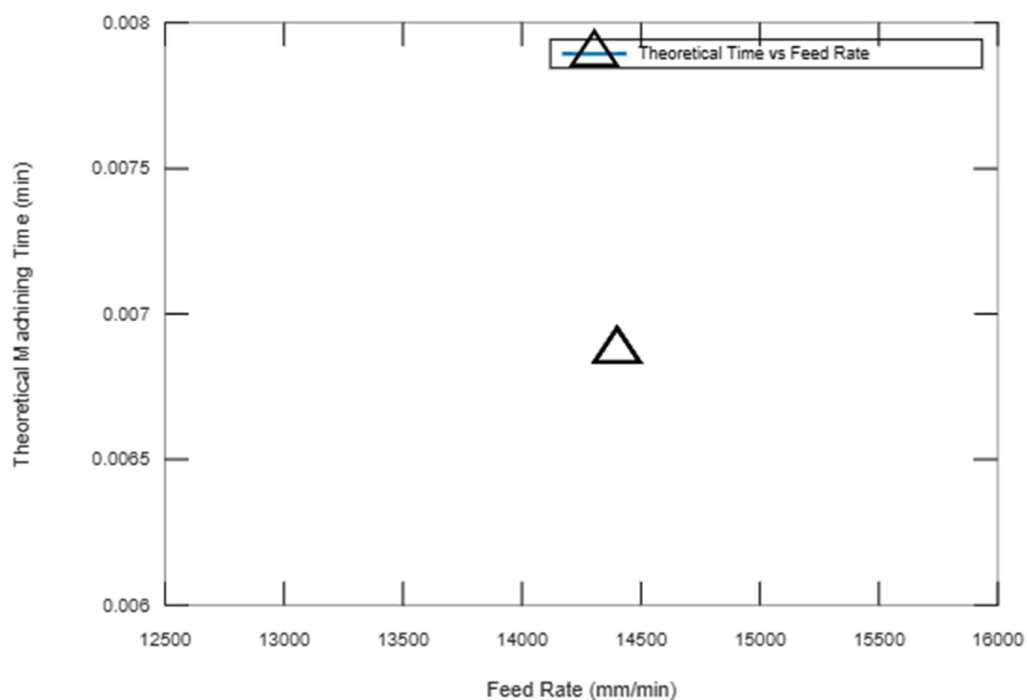
Graphs:

Lab 09: RPM vs Cutting Speed (Barira Qasim - F2022031016)

Lab 09: RPM vs Feed Rate (Barira Qasim - F2022031016)
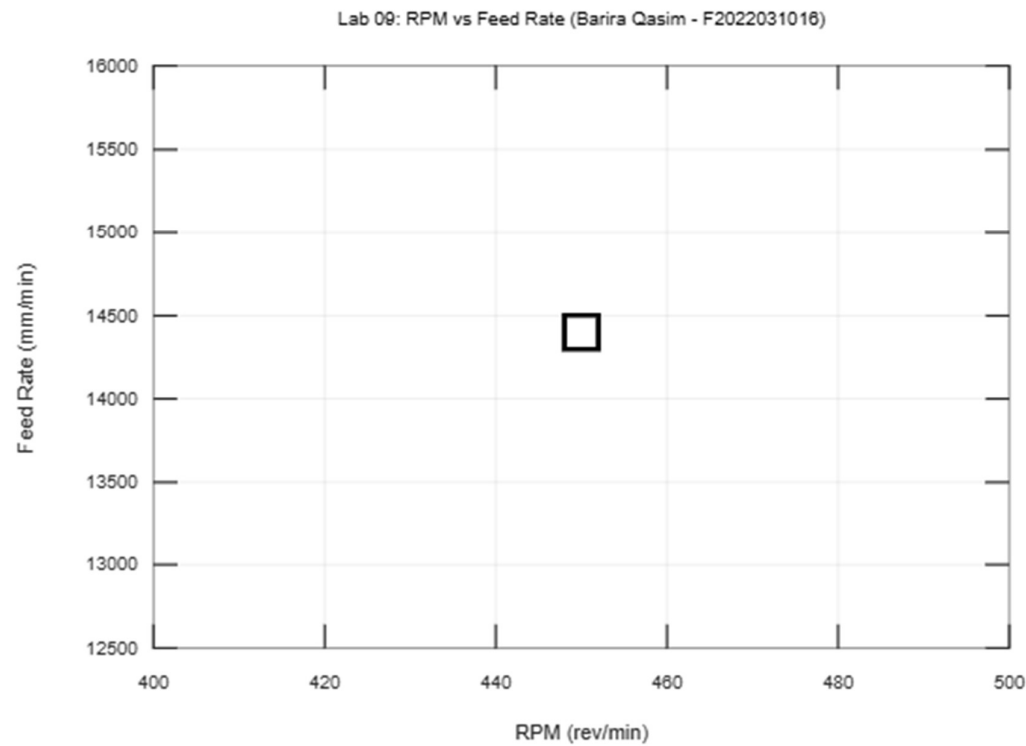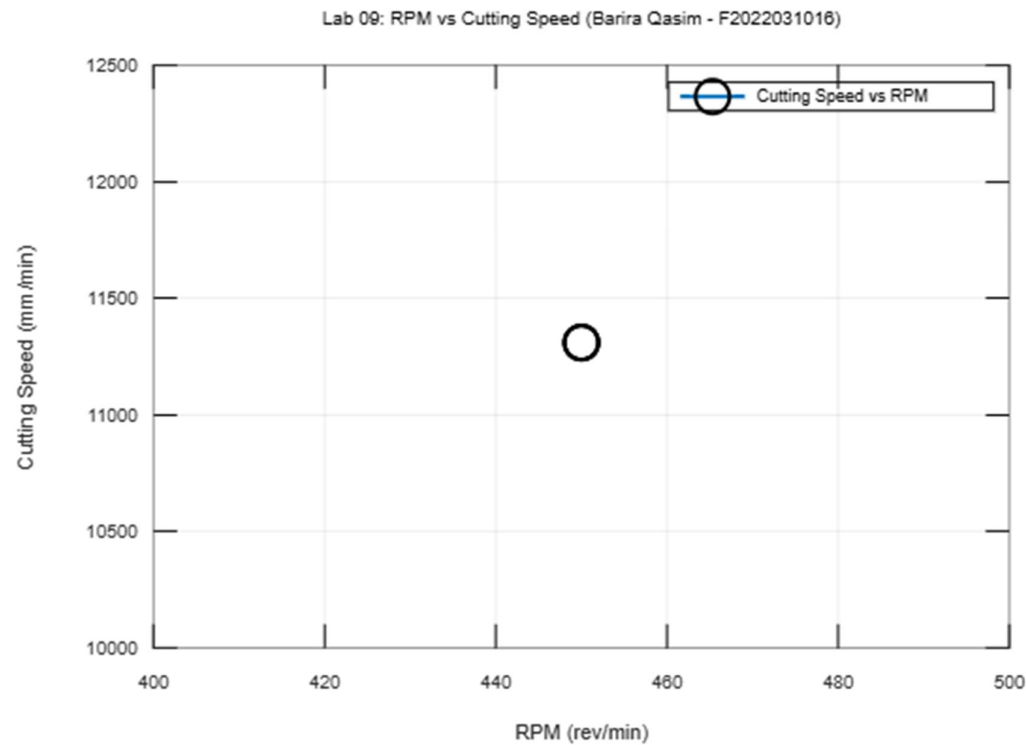
Lab 09: Cutting Speed vs Feed Rate (Barira Qasim - F2022031016)

Lab 09: Actual vs Theoretical Machining Time (Barira Qasim - F2022031016)

Lab 09: Feed Rate vs Theoretical Machining Time (Barira Qasim - F2022031016)

Lab 09: Feed Rate vs Actual Machining Time (Barira Qasim - F2022031016)