MATLAB Assignment Report

Date: 25-10-2024

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1. MATLAB Stateflow

1.1 Washing Machine Cycle State flow Chart

States:

Fill: The washing machine fills with water.

Operation: Start water flow; monitor water level.

Wash: Clothes are washed.

Operation: Agitate clothes for a set duration.

Rinse: Clothes are rinsed.

Operation: Drain dirty water; fill with clean water; agitate.

Spin: Excess water is spun out of the clothes.

Operation: Spin cycle at high speed.

Done: Cycle completion.

Operation: Notify user; end program.

Simulation Flow:

1. Start at Fill.
2. Transition to Wash after the fill is complete.
3. Transition to Rinse after washing.
4. Transition to Spin after rinsing.
5. Transition to Done after spinning.

INTERFACE

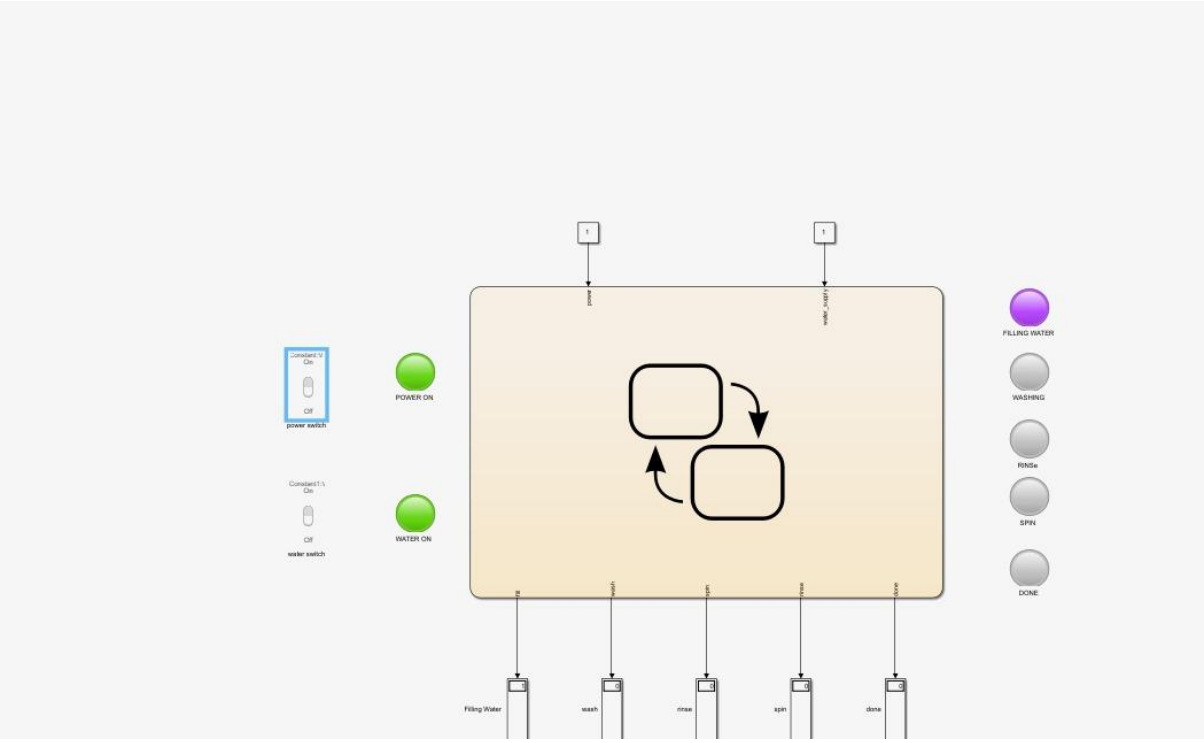
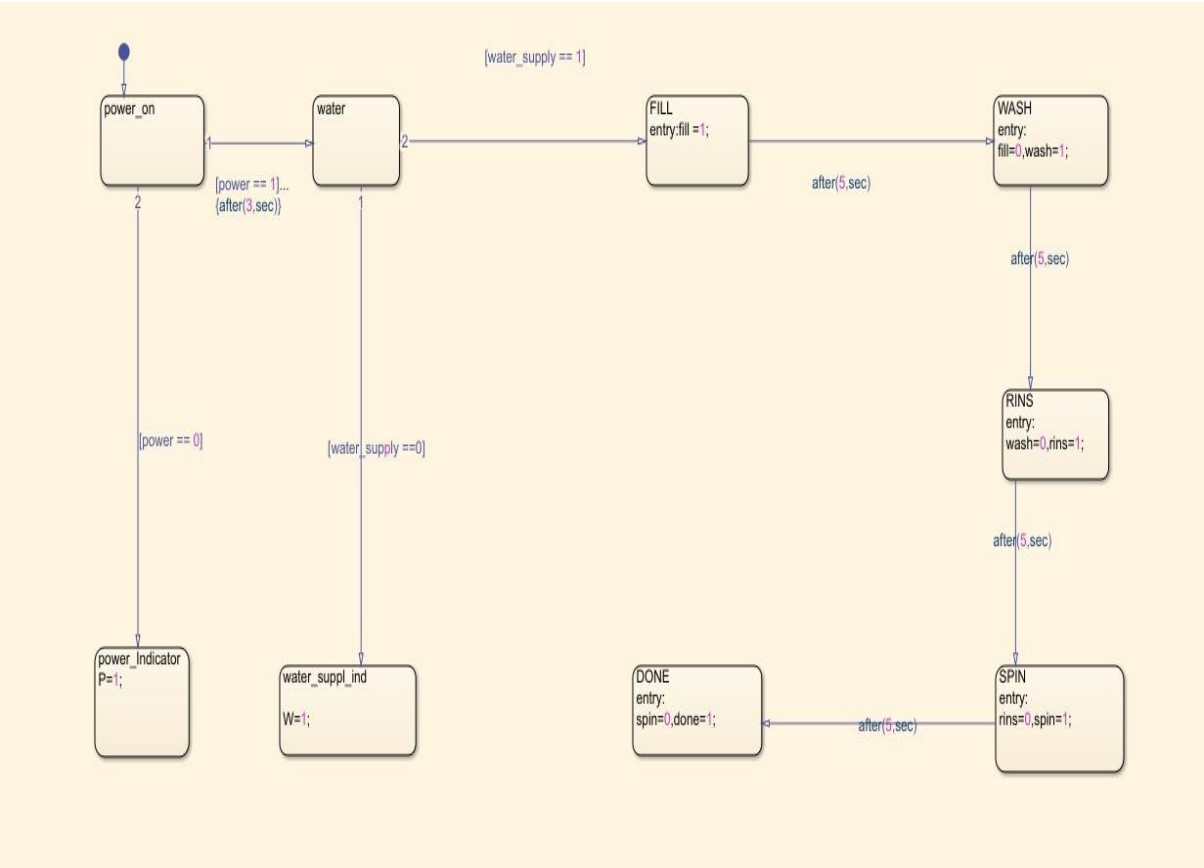


CHART DETAILSA



1.2 Elevator Control System State flow Chart

States:

- Floor 1: At the first floor.

- Floor 2: At the second floor.

- Floor 3: At the third floor.

Transitions:

- Up: Move to the next floor.

-Down: Move to the previous floor.

Door Logic:

- Open Door: When the elevator reaches a floor.

- Close Door: After a set duration or upon request.

I Had designed for three floors

INTERFACE

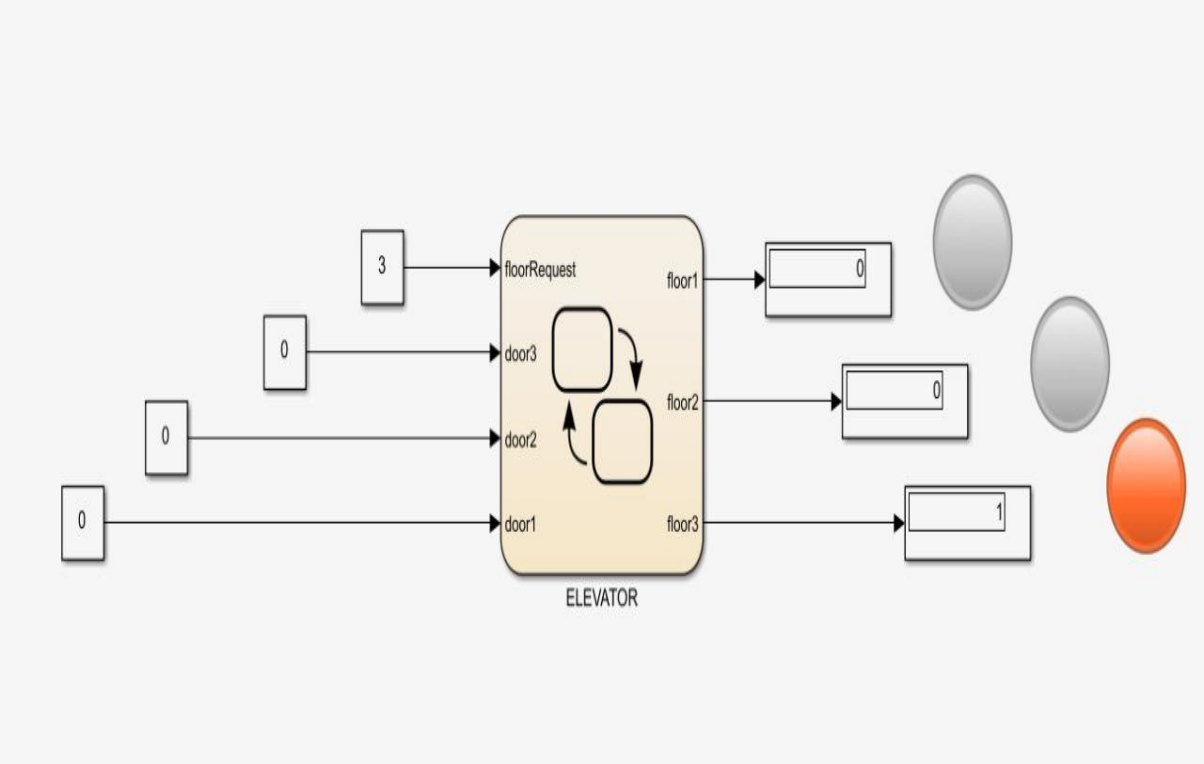
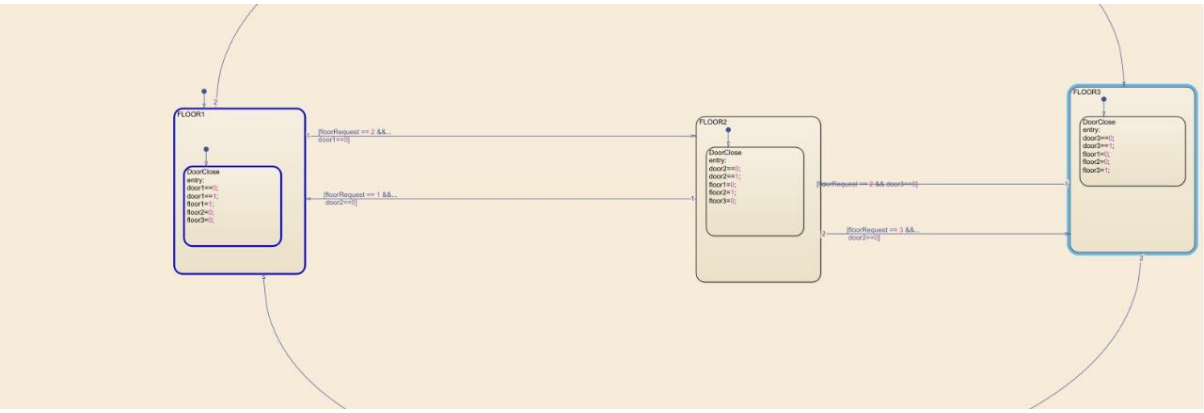


CHART DETAILS



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2. MATLAB Programming

2.1 Projectile Trajectory Simulation

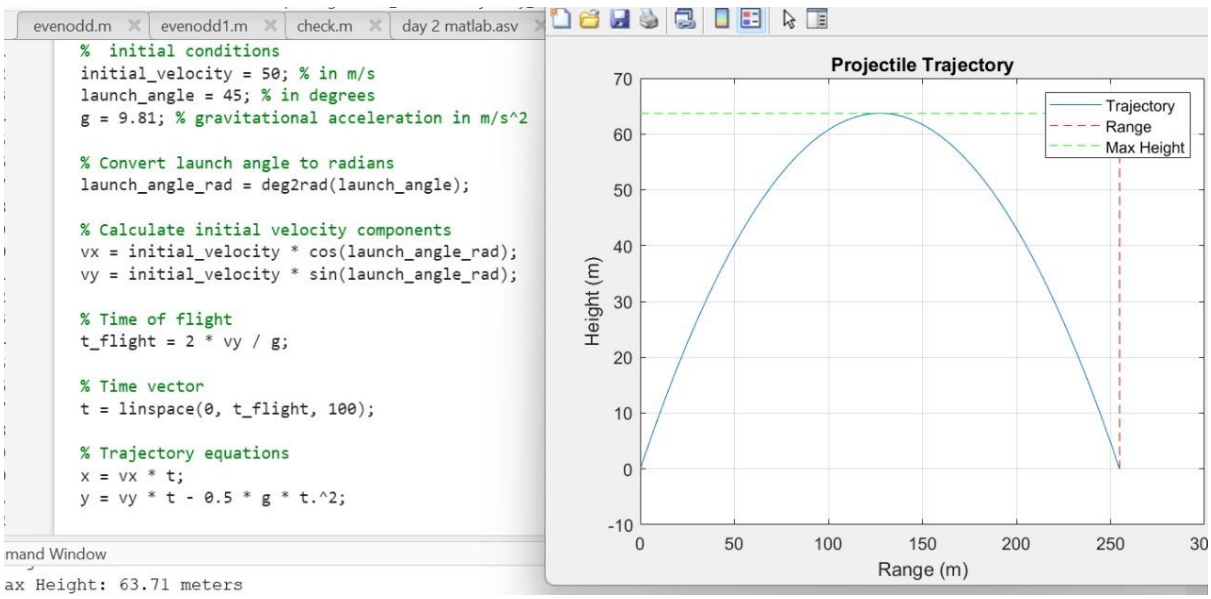
Script Overview:

- Define initial velocity, launch angle, and gravitational acceleration.

- Calculate the trajectory using kinematic equations.

- Plot range and maximum height.

matlab



Trajectory_Of_Projectile.m

```
figure;
plot(x, y);
title('Projectile Trajectory');
xlabel('Range (m)');
ylabel('Height (m)');
grid on;

% Calculate and plot range and max height
range = vx * t_flight;
max_height = (vy^2) / (2 * g);

hold on;
plot([range, range], [0, max_height], 'r--');
plot([0, range], [max_height, max_height], 'g--');
legend('Trajectory', 'Range', 'Max Height');
hold off;

% Display range and max height
fprintf('Range: %.2f meters\n', range);
fprintf('Max Height: %.2f meters\n', max_height);
```

ommand Window

```
>> Trajectory_Of_Projectile
Range: 254.84 meters
Max Height: 63.71 meters
>>
```

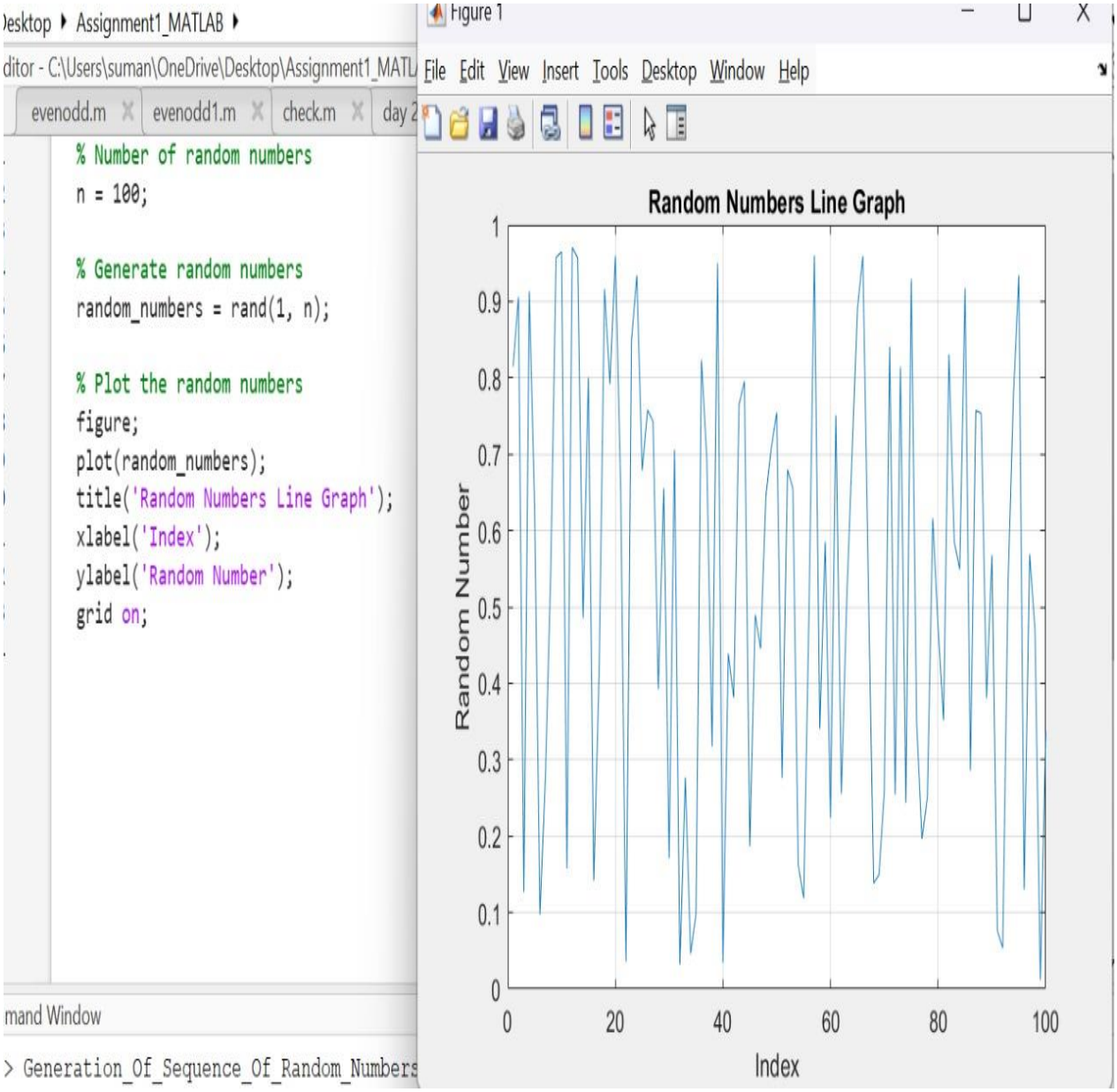
2.2 Random Number Sequence Plot

Script Overview:

- Generate a sequence of random numbers.

- Plotting graph.

matlab



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3. Simulink

3.1 RC Circuit Response

Model Overview:

- Simulate the response of an RC circuit to a step input voltage.

- Analyze charging and discharging curves.

Simulink Steps:

1. Create a block diagram with resistor (R) and capacitor (C).

2. Add a step input source.

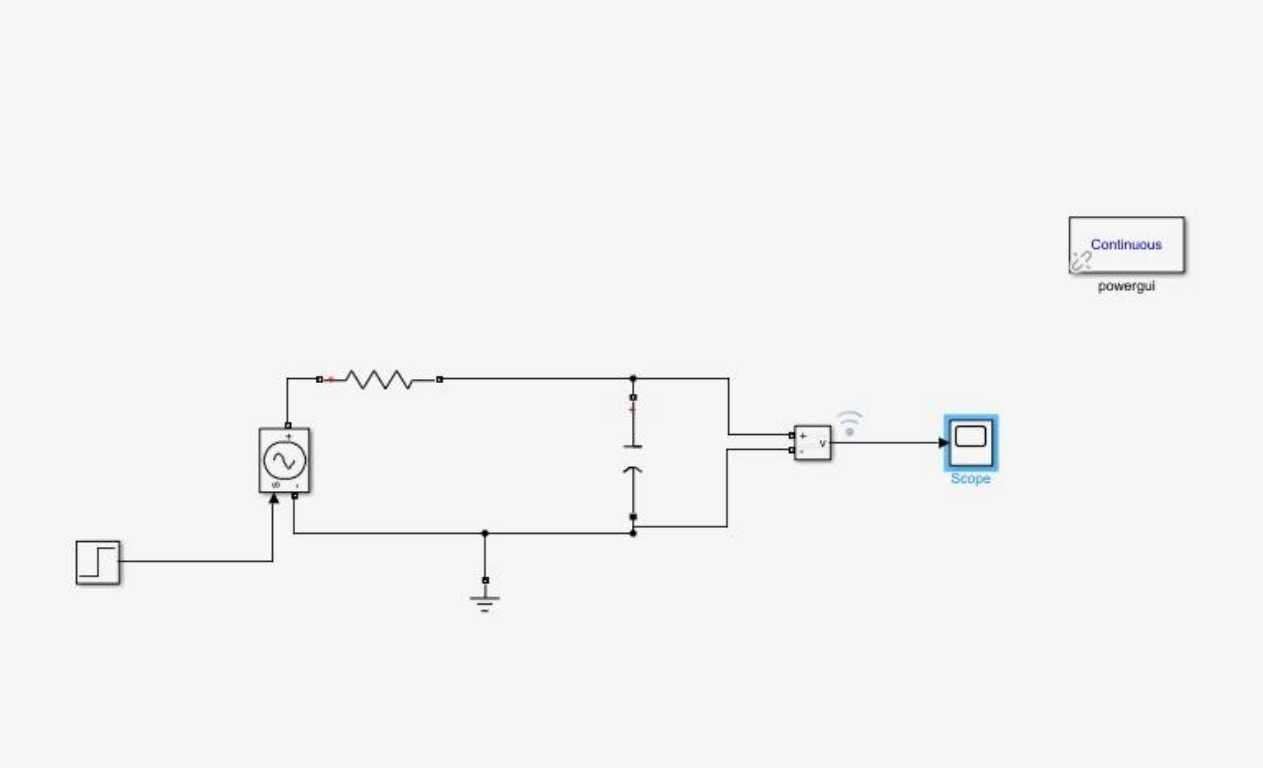
3. Measure voltage across the capacitor.

Analysis:

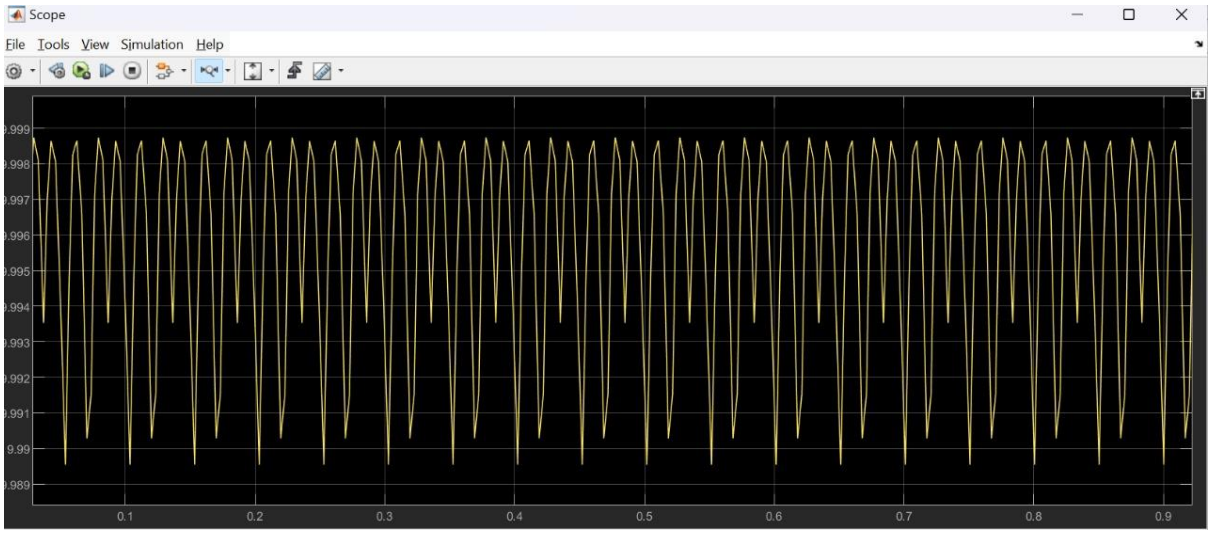
- Time constant (τ) is calculated as $\tau = R * C$.

- Observe charging curve to find steady-state voltage.

INTERFACE



SCOPE OUTPUT



3.2 Water Tank Temperature Change

Model Overview:

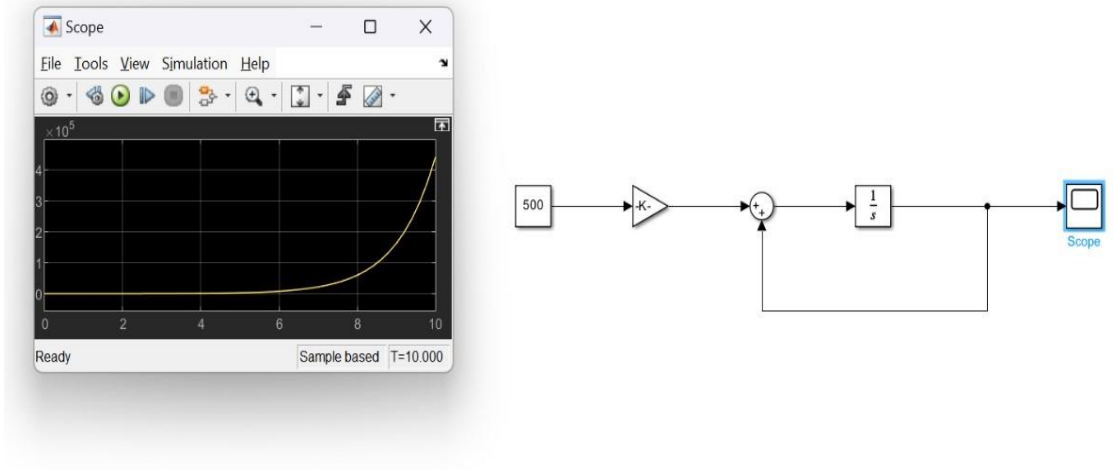
- Simulate the temperature rise in a water tank over time with a heat source.

Simulink Steps:

1. Use a thermal block to represent the tank.

2. Apply a constant heat input.

3. Measure temperature change over time.



4. PID Control in MATLAB/Simulink

4.1 Transfer Function 1

Given:

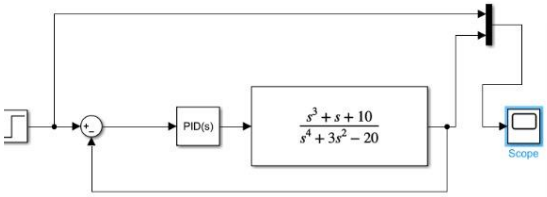
[tf = frac{s^3 - s + 10}{s^4 + 3s^2 - 20}]

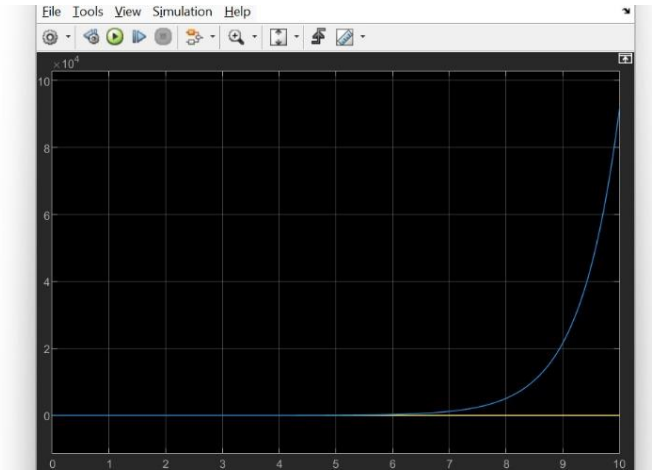
Steps:

1. Define the transfer function in MATLAB.

2. Analyze its stability and response.

AFTEER COMPLETION OF TUNING THE PID CONTROLLER THE RESPECTED OUTPUT SHOWS





4.2 Transfer Function 2

Given:

tf = frac{s^3 + 2s^2 + s + 10}{s^4 + 3s - 20}

Steps:

1. Define the transfer function in MATLAB.

2. Perform a step response analysis.

AFTEER COMPLETION OF TUNING THE PID CONTROLLER THE RESPECTED OUTPUT SHOWS

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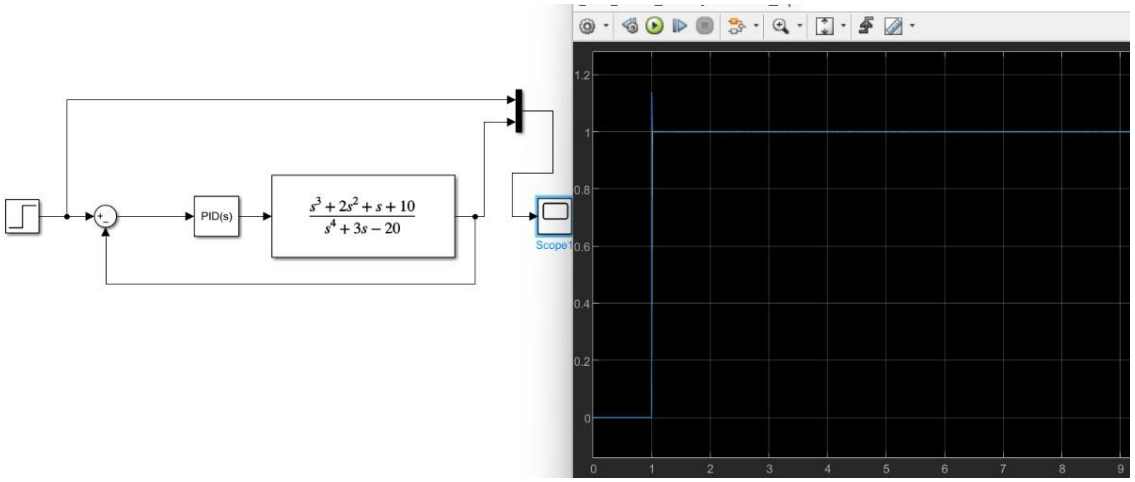

Conclusion:

This assignment provided a comprehensive overview of State flow, MATLAB programming, and Simulink modeling. Each section was designed to enhance understanding of control systems and simulation methodologies. Further exploration of each topic can deepen the knowledge and application skills in MATLAB and Simulink.