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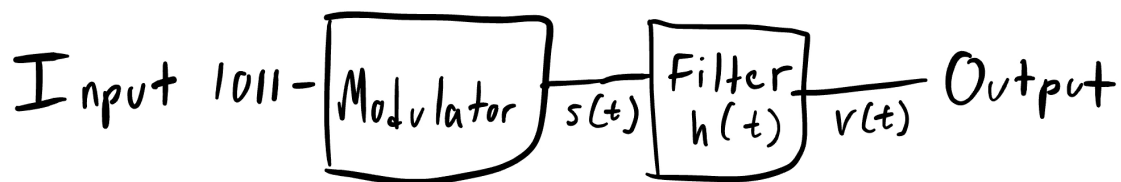
RUID: 208001821

Date: 2/28/2025

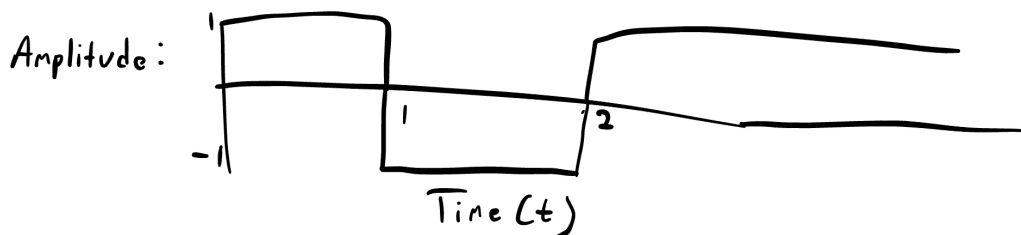
Report Format: Report should include the following four sections in this order and each starting in a new page. All pages should be submitted together in a single pdf file. If this format is not followed up to a 2 point (out of 10 points) penalty will be assessed.

Report Sections:

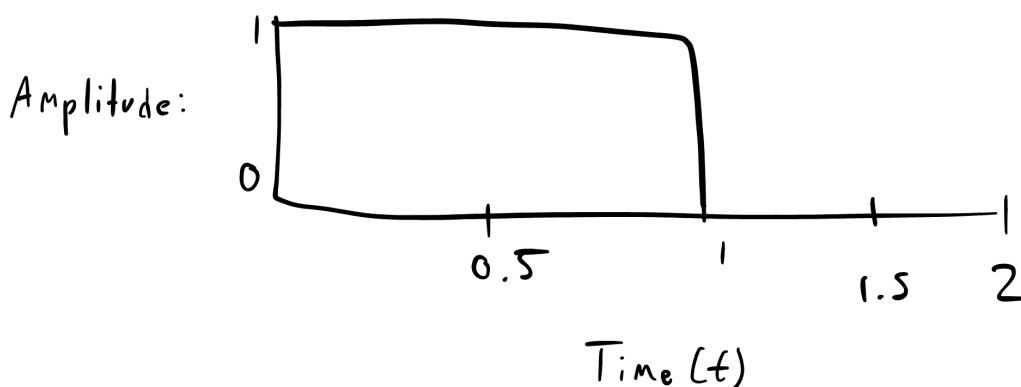
Block diagram, sketches and notation:

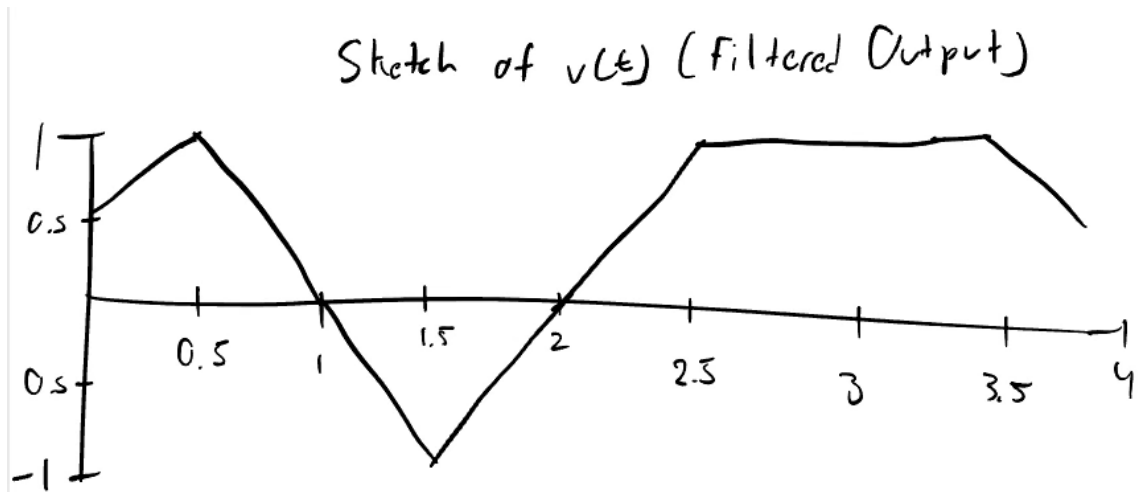


Sketch of $s(t)$ (Input Signal)

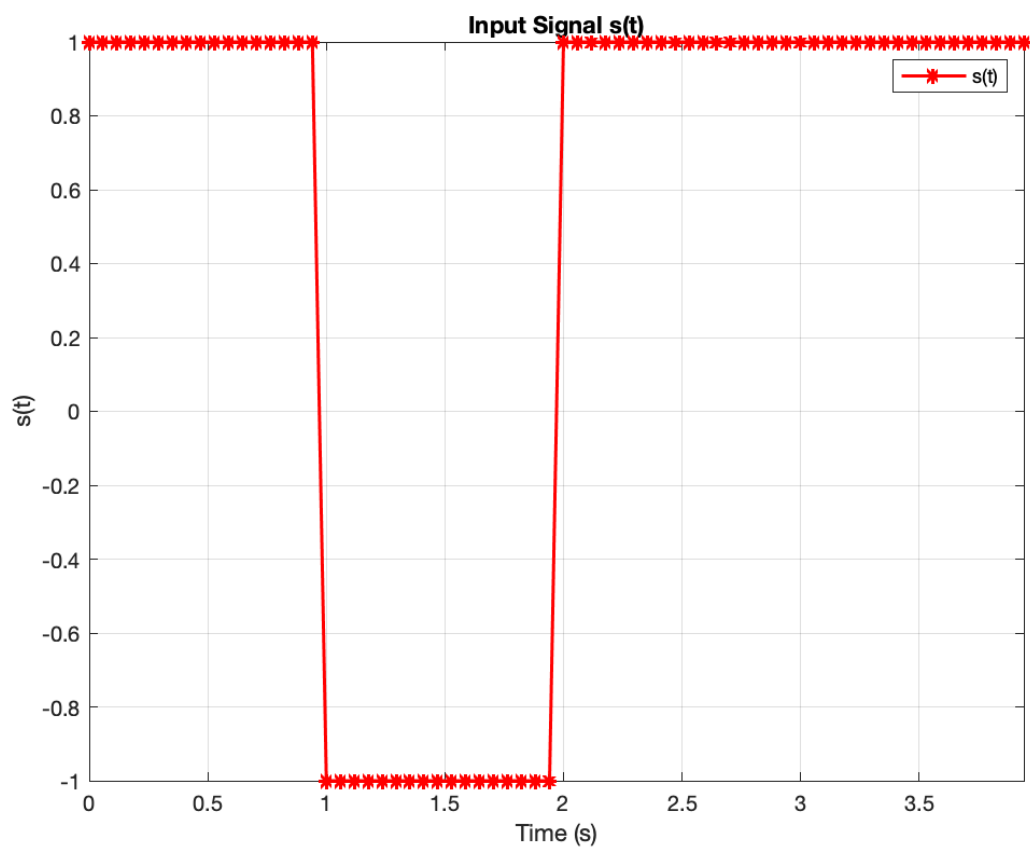


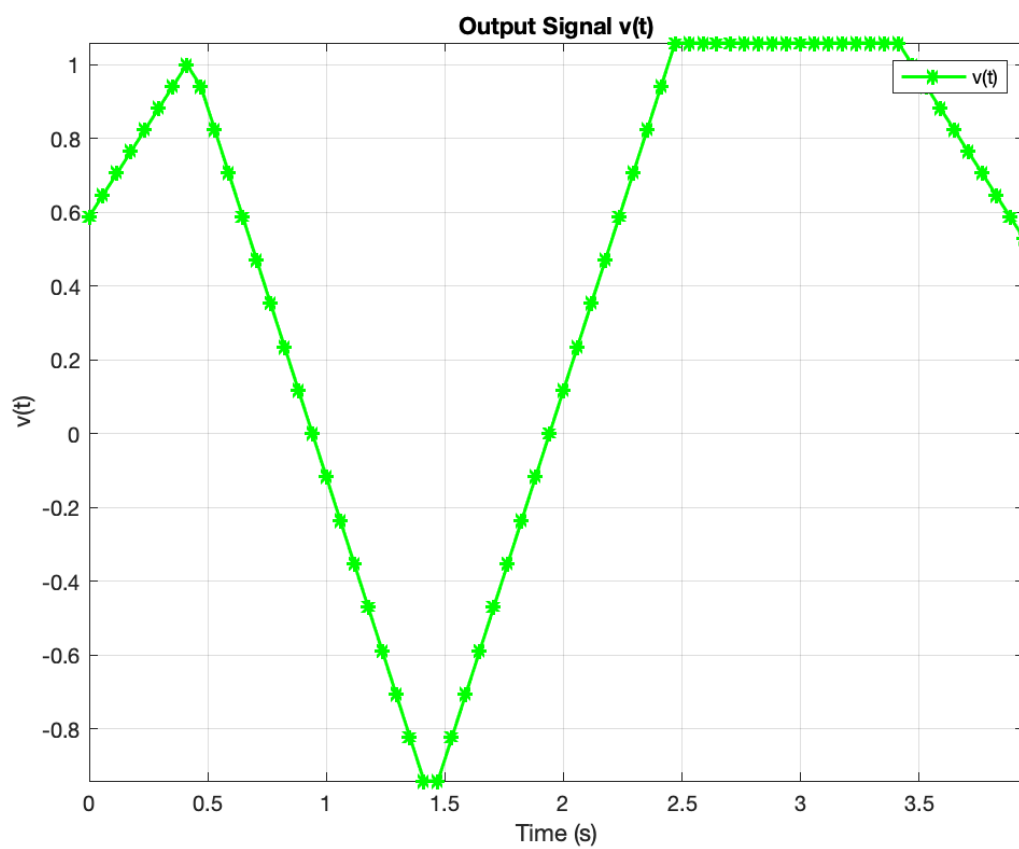
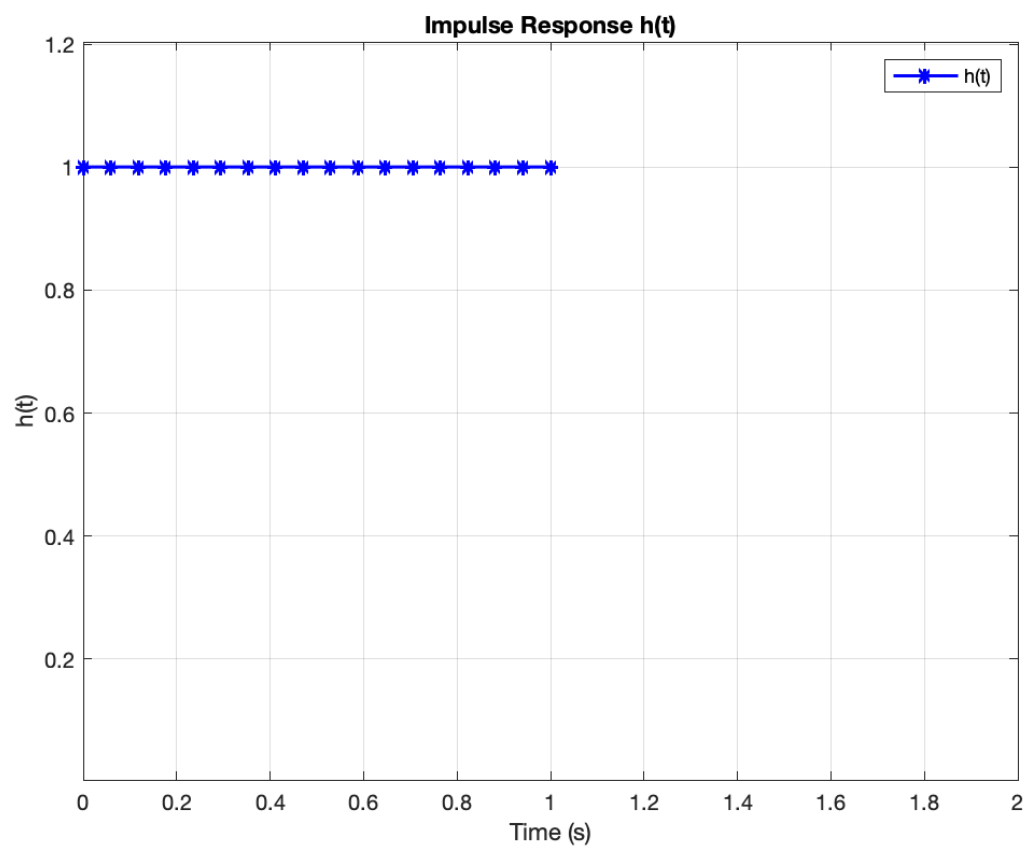
Sketch of $h(t)$ (Impulse Response)





Results:





Sampling Interval Ts: 0.0588 seconds
Chosen N: 17

MATLAB Code:

HW2.m

```
clc; clear; close all;

% Step 1: Set fixed random seed for reproducibility
rng(123);

% Step 2: Generate random N
N = floor(rand * 20 + 4); %
T = 1;
Ts = T / N;

% Step 3: Generate h(t) = p(t) (Unit pulse from 0 to T)
t_h = 0:Ts:T;
h = ones(size(t_h));

% Step 4: Define input signal s(t)
t_s = 0:Ts:4*T-Ts;
s = [ones(1, N), -ones(1, N), ones(1, N), ones(1, N)];

% Step 5: Pass s(t) through h(t) (convolution)
v = conv(s, h, 'same') * Ts;
t_v = t_s;

% Plot Input Signal s(t)
figure;
plot(t_s, s, 'r-*', 'LineWidth', 1.5);
xlabel('Time (s)'); ylabel('s(t)');
title('Input Signal s(t)');
legend('s(t)');
grid on;
xlim([0 max(t_v)]);
```

```

% Plot Impulse Response h(t) (Keep h(t) the Same,
Extend x-Axis to 2 sec)
figure;
plot(t_h, h, 'b-*', 'LineWidth', 1.5);
xlabel('Time (s)'); ylabel('h(t)');
title('Impulse Response h(t)');
legend('h(t)');
grid on;
xlim([0 2]);
ylim([0 1.2]);

% Plot Output Signal v(t)
figure;
plot(t_s, v, 'g-*', 'LineWidth', 1.5);
xlabel('Time (s)'); ylabel('v(t)');
title('Output Signal v(t)');
legend('v(t)');
grid on;
xlim([0 max(t_v)]);
ylim([min(v) max(v)]);

% Print important values
fprintf('Chosen N: %d\n', N);
fprintf('Sampling Interval Ts: %.4f seconds\n', Ts);

```