hw02_MATLAB

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58(1)

```
syms t T;

% 原始信号 sin(t)
original_signal = sin(t);

% 向右平移了T/2的冲激信号
shifted_signal = dirac(t - T/2);

% 计算乘积
product_signal = original_signal * shifted_signal;

% 计算在(-∞, ∞)上的积分
integral_product = int(product_signal, t, -inf, inf);

disp(['sin(t) 与向右平移了T/2的冲激信号乘积在(-∞, ∞)上的积分: ', char(integral_product)]);
```

Listing 1: 题 58(1)MATLAB 代码

Answer:

$$\sin\left(\frac{T_1}{2}\right)$$

58(2)

```
syms t;

% 信号1
coefficients = [1, 0, 1, 2];
```

```
polynomial_value = poly2sym(coefficients, t);

% 信号2
shifted_dirac = dirac(t - 1);

% 计算抽样值
integral_product = int(polynomial_value * shifted_dirac, t, -inf
    , inf);

fprintf('抽样结果: %s\n', char(integral_product));
```

Listing 2: 题 58(2)MATLAB 代码

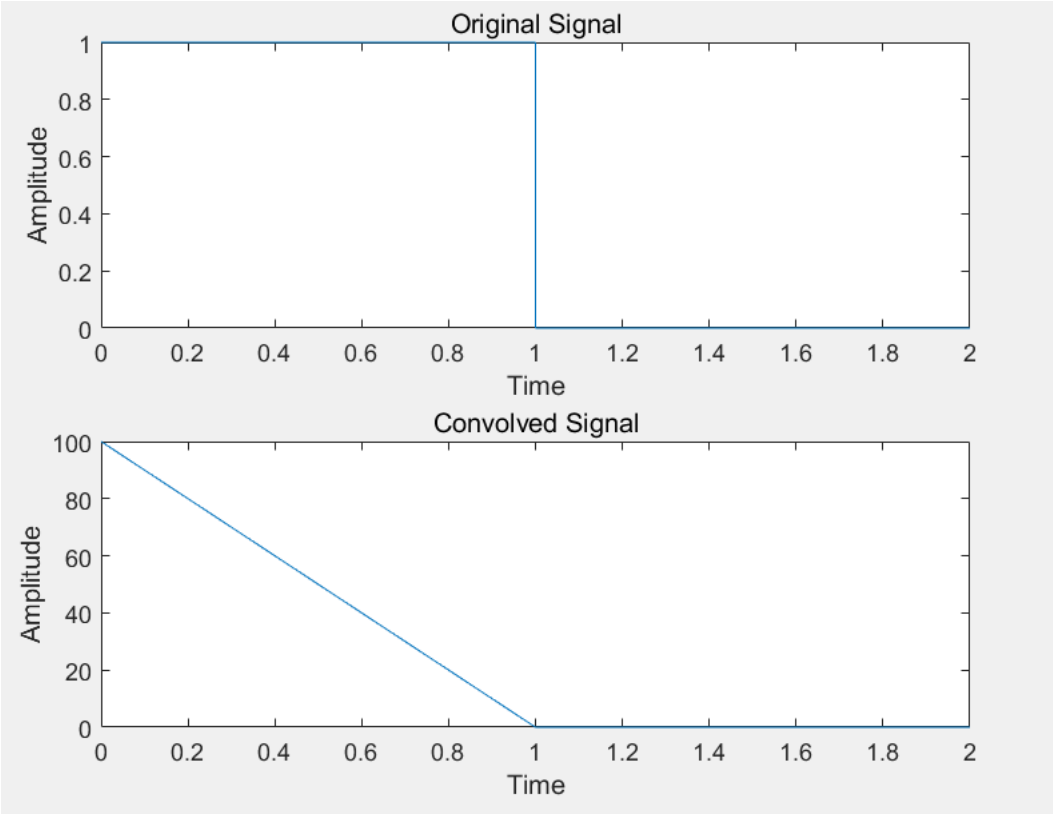
Answer: 4

Additional(2)(1)

```
t1 = 0:0.01:1; % 时间范围从0到1, 采样间隔0.01
x1 = ones(size(t1)); % 信号值为1

t2 = 1:0.01:2; % 时间范围从1到2, 采样间隔0.01
x2 = zeros(size(t2)); % 信号值为0

t = [t1 t2]; % 合并时间向量
x = [x1 x2]; % 合并信号值向量

y = conv(x, x, 'same'); % 计算信号x与自身的卷积

subplot(2,1,1);
plot(t, x);
title('Original Signal');
xlabel('Time');
ylabel('Amplitude');

subplot(2,1,2);
plot(t, y);
title('Convolved Signal');
xlabel('Time');
ylabel('Amplitude');
```

Listing 3: 题 Additional(2)(1)MATLAB 代码

Answer:



Addition(2)(2)

```
% 定义时间向量
t = 0:0.01:2;

% 信号一: 在0时刻突变为1, 之后保持1直到1时刻突变为0
signal_1 = zeros(size(t));
signal_1(t >= 0 & t < 1) = 1;

% 信号二: 在0时刻突变为1, 然后线性下降至1时刻为0
signal_2 = zeros(size(t));
signal_2(t >= 0 & t < 1) = 1 - t(t >= 0 & t < 1);

% 计算卷积
convolution_result = conv(signal_1, signal_2, 'full');

% 绘制信号和卷积结果
figure;
```

```
17
18              subplot(3,1,1);
19              plot(t, signal_1);
20              title('信号一');
21
22              subplot(3,1,2);
23              plot(t, signal_2);
24              title('信号二');
25
26              subplot(3,1,3);
27              t_conv = 0:0.01:4; % 卷积结果的时间范围
28              plot(t_conv, convolution_result);
29              title('信号一和信号二的卷积结果');
30              xlabel('时间');
```

Listing 4: 题 Additional(2)(2)MATLAB 代码

Answer: