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```
clc;
clear;
close all;
```

## Time vector - transition at $t = 0.001$ s (1 ms)

```
t1 = 1e-3; % transition time
t = linspace(0, 20e-3, 20000); % 0 to 20 ms with high resolution for smooth
oscillations
```

## Create index arrays for the two regions

```
idx1 = (t >= 0 & t < t1);
idx2 = (t >= t1);
```

## --- $V_c(t)$ Capacitor Voltage ---

```
Vc = zeros(size(t));
% Region 1:  $0 \leq t < 0.001$ 
Vc(idx1) = 21.68*exp(-83*t(idx1)) - 21.57*exp(-1917*t(idx1));
% Region 2:  $t \geq 0.001$ 
Vc(idx2) = 16.78*cos(400*(t(idx2) - t1)) + 4.485*sin(400*(t(idx2) - t1));
```

## --- $I_L(t)$ Inductor Current ---

```
IL = zeros(size(t));
% Region 1:  $0 \leq t < 0.001$ 
IL(idx1) = 0.1 - 0.1045*exp(-83*t(idx1)) + 0.0045*exp(-1917*t(idx1));
% Region 2:  $t \geq 0.001$ 
IL(idx2) = 0.004485*cos(400*(t(idx2) - t1)) - 0.01678*sin(400*(t(idx2) - t1));
```

## --- Plot both responses ---

```
figure('Position',[100 100 800 600]);

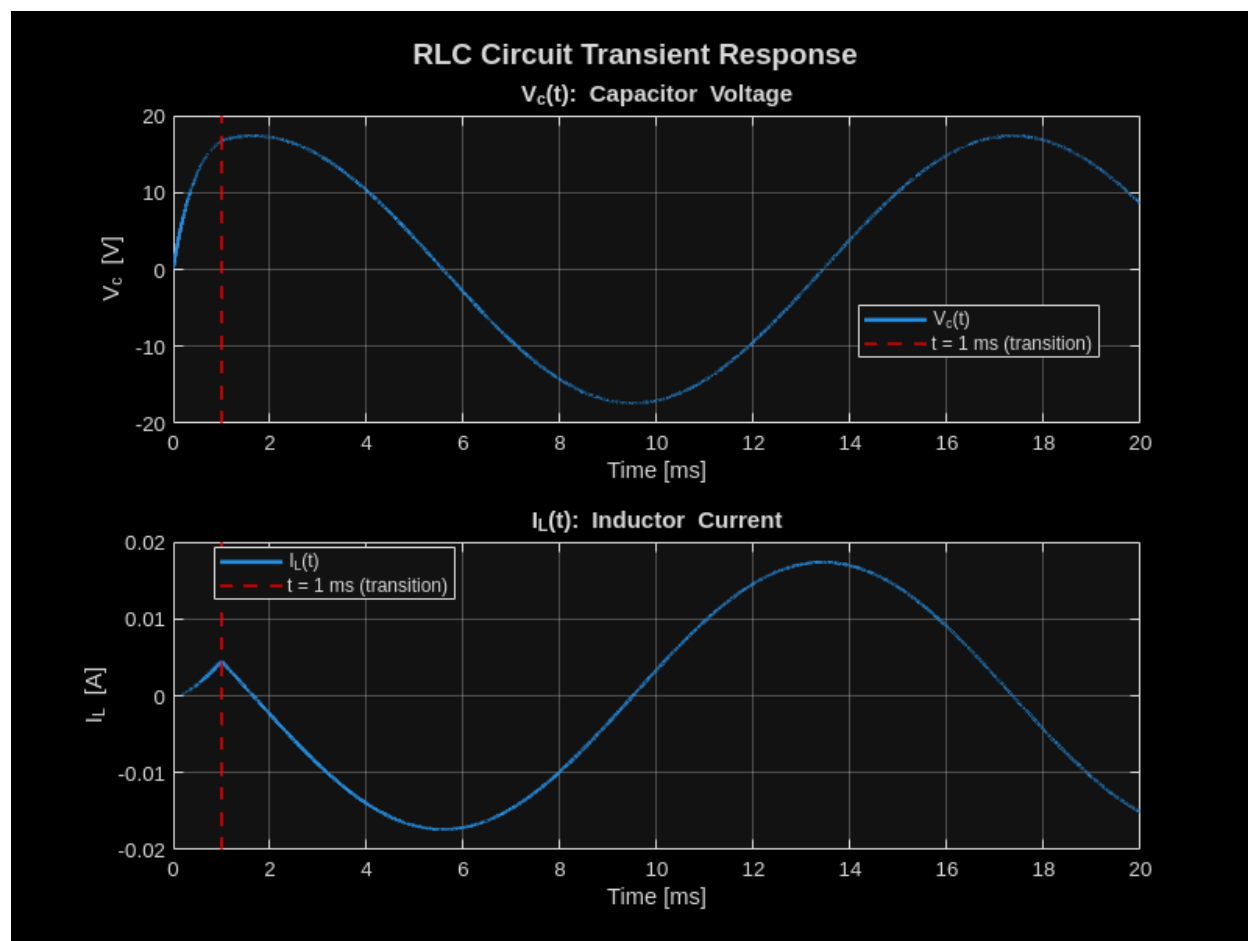
%  $V_c(t)$  - Capacitor Voltage
subplot(2,1,1)
plot(t*1e3, Vc, 'LineWidth', 2);
```

---

```
hold on;
xline(t1*1e3, '--r', 'LineWidth', 1.5); % mark transition point
hold off;
xlim([0 20]); % 0 to 20 ms window
title('V_c(t): Capacitor Voltage');
ylabel('V_c [V]');
xlabel('Time [ms]');
grid on;
legend('V_c(t)', 't = 1 ms (transition)', 'Location', 'best');

% I_L(t) - Inductor Current
subplot(2,1,2)
plot(t*1e3, IL, 'LineWidth', 2);
hold on;
xline(t1*1e3, '--r', 'LineWidth', 1.5); % mark transition point
hold off;
xlim([0 20]); % 0 to 20 ms window
title('I_L(t): Inductor Current');
ylabel('I_L [A]');
xlabel('Time [ms]');
grid on;
legend('I_L(t)', 't = 1 ms (transition)', 'Location', 'best');

sgtitle('RLC Circuit Transient Response', 'FontWeight', 'bold');
```



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