INC 122 Electric Circuit Analysis II **In class assignment 1**
Assign: 31 Jan 2024 **Due for 2Wil, 2A: 2 Feb 2024**

Instruction: This is an in class assignment.
Member:

1. Name:_____Code:_____
2. Name:_____Code:_____

1. The waveform for the current in a 200-μF capacitor is shown in Fig **??**. Determine the waveform for the capacitor voltage.

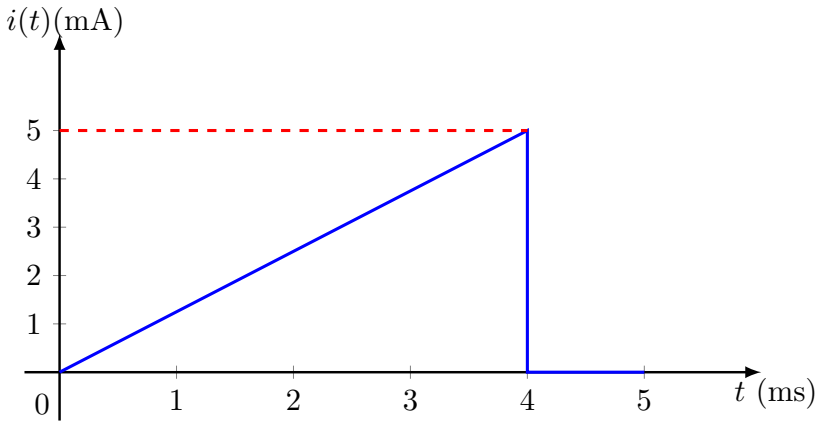

Figure 1: For Question 1

Solution: We have

$$v_C(t) = \frac{1}{C}\int_{t_0}^{t} i_C(\tau)d\tau + v_C(t_0)$$

From the Fig **??**, we have

$$i_C(t) = \begin{cases} 0 \text{ A}, & t < 0 \text{ ms} \\ \frac{5}{4}t \text{ A}, & 0 \le t < 4 \text{ ms} \\ 0 \text{ A}, & t \ge 4\text{ms} \end{cases}, \qquad v_C(t) = \begin{cases} 0 \text{ V}, & t < 0 \text{ ms} \\ 3.125 \times 10^3 t^2 \text{ V}, & 0 \le t < 4 \text{ ms} \\ 0.05 \text{ V} & t \ge 4 \text{ ms} \end{cases}$$

Note: $v_C(t = 4\text{ms}) = 3.125 \times 10^3(4 \times 10^{-3})^2 = 0.05$ V. The $v_C(t > 4\text{ms}) = \frac{1}{C}\int_{4\times10^{-3}}^{\infty} 0d\tau + v_C(4 \times 10^{-3}) = 0.05$ V. The plot of $v_C(t)$ is shown in Fig **??**.

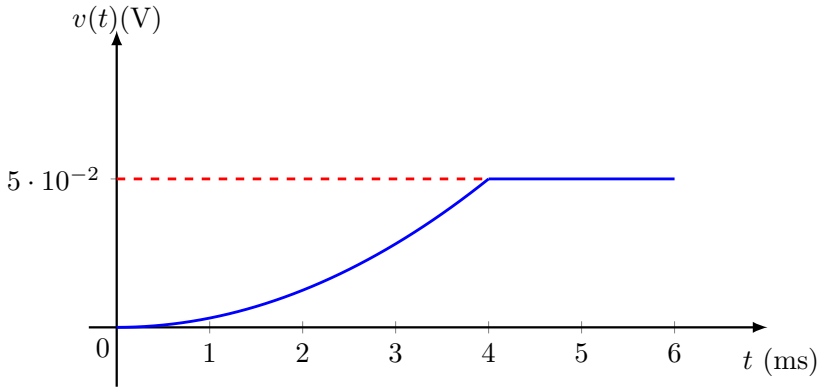

Figure S1: $v_C(t)$

2. The current in a 10-mH inductor has the waveform shown in Fig. **??**. Determine the voltage waveform.

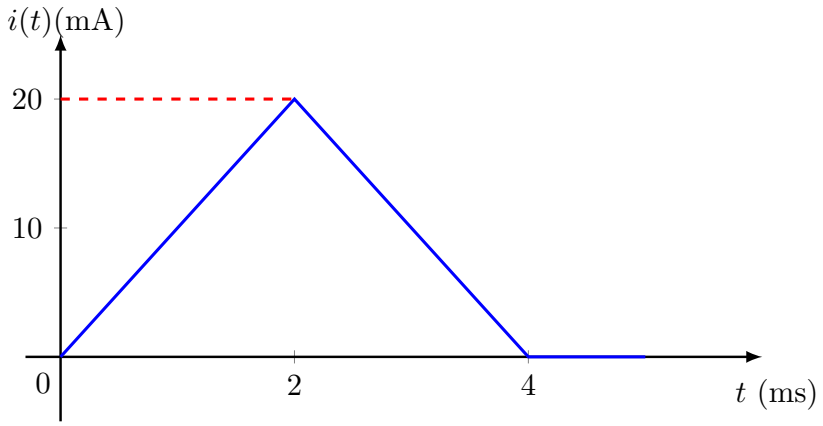

Figure 2: For Question 2

Solution: The equation for the current waveform in the specified time intervals are

$$i(t) = \begin{cases} 0 \text{ A}, & t < 0 \\ 10t \text{ A}, & 0 \le t \le 2 \text{ ms} \\ -10t + 40 \times 10^{-3} \text{ A}, & 2 \text{ ms} \le t \le 4 \text{ ms} \\ 0 \text{ A}, & t \ge 4 \text{ ms} \end{cases}$$

From $v(t) = Ldi(t)/dt$, we have

$$v(t) = \begin{cases} 0 \text{ mV}, & t < 0 \\ 100 \text{ mV}, & 0 \le t \le 2 \text{ ms} \\ -100 \text{ mV}, & 2 \text{ ms} \le t \le 4 \text{ ms} \\ 0 \text{ mV}, & t \ge 4 \text{ ms} \end{cases}$$

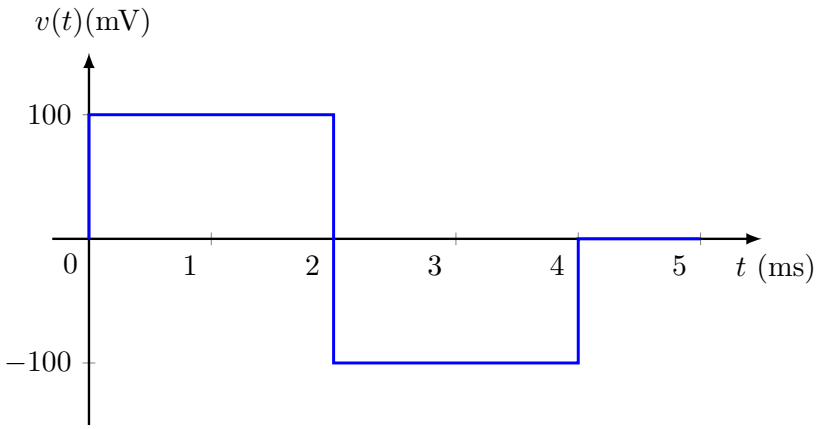

Figure S2: Voltage $v(t)$

Then the voltage waveform is shown in Fig **??**

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