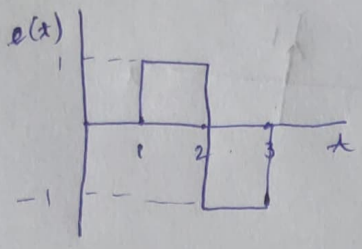
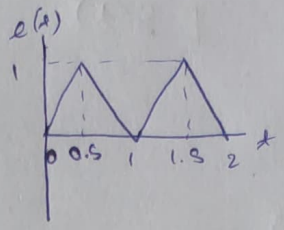
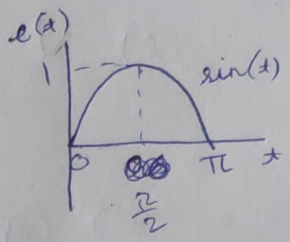
Waveforms



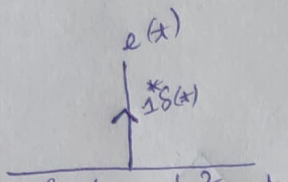
(a)



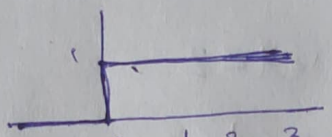
(b)



(c)



(d)

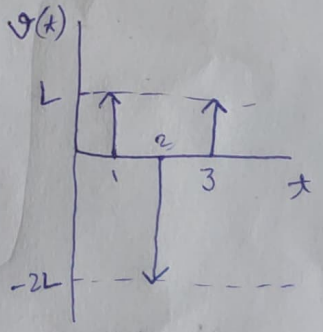


(e)

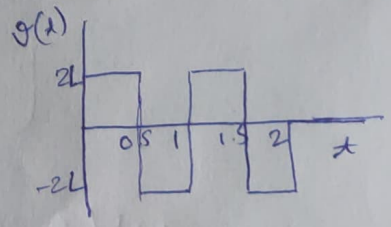
PART

Q1) (1) ⇒ Inductor

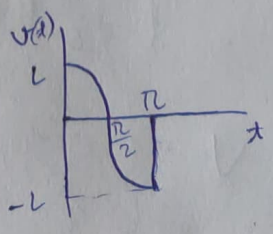
(a) $V = L\frac{di}{dt} = L\,\delta(t-1) - 2L\delta(t-2) + L\delta(t-3)$



(b) $V = L\frac{di}{dt} = \begin{cases} 2L, & 0 < t < 0.5 \\ -2L, & 0.5 < t < 1 \\ 2L, & 1 < t < 1.5 \\ -2L, & 1.5 < t < 2 \\ 0, & \text{otherwise} \end{cases}$

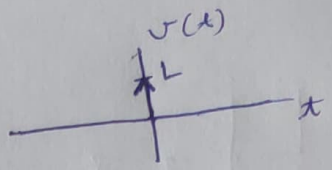


(c) $V = L\frac{di}{dt} = \begin{cases} L\cos(t), & 0 < t < \pi \\ 0, & \pi < t \end{cases}$



(d) $V = L\frac{di}{dt} = L\dot{\delta}(t)$

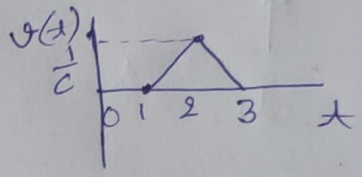
(e) $V = L\frac{di}{dt} = L\,\delta(t)$



$\Rightarrow$ Capacitor

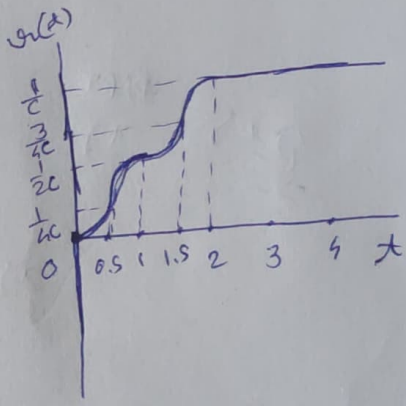
$$V = \frac{Q}{C} = \frac{\int_0^t i\,dt}{C}$$

(a) $$V = \begin{cases} \frac{1}{C}(t-1) & , 1 \le t < 2 \\ \frac{1}{C}(3-t) & , 2 < t < 3 \\ 0 & , \text{otherwise} \end{cases}$$

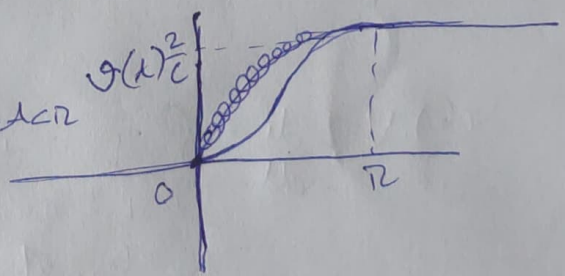


(b) $$V = \begin{cases} 0 & t < 0 \\ \frac{1}{C}t^2 & , 0 < t < 0.5 \\ \frac{1}{C}\left(-t^2 + 2t - \frac{1}{2}\right) & , 0.5 < t < 1 \\ \frac{1}{C} & 2 < t \end{cases}$$

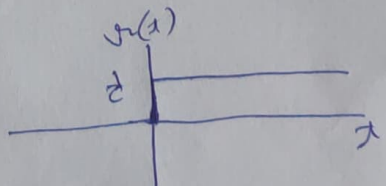
For $1 < t < 2$ it will be the same curve shifted horizontally by 1 and vertically by $\frac{1}{2C}$.



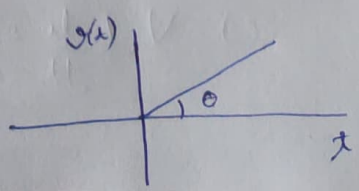
(c) $$V = \begin{cases} \frac{1-\cos(t)}{C} & , 0 < t < \pi \\ \frac{2}{C} & 0 < t \end{cases}$$



(d) $$A = \begin{cases} 0 & t < 0 \\ \frac{1}{C} & 0 < t \end{cases}$$



(e) $$V = \begin{cases} 0 & , t < 0 \\ \frac{t}{C} & , 0 < t \end{cases}$$



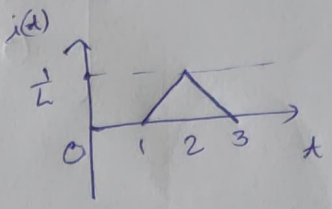
$\tan\theta = \frac{1}{C}$

PART

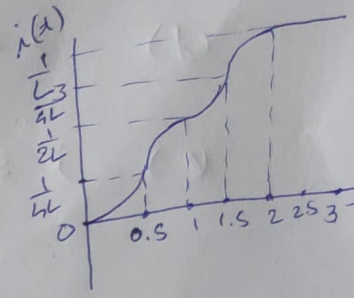
Q1) (2) $\Rightarrow$ Inductor

$$v = L\frac{di}{dt} \rightarrow i = \frac{\int_0^t v\,dt}{L}$$

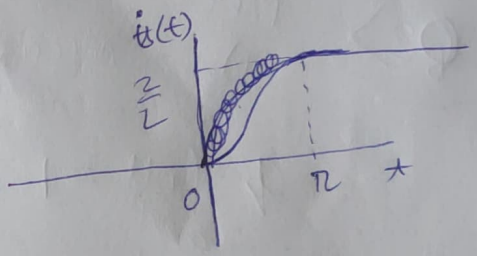
(a) $$i = \begin{cases} \frac{1}{L}(t-1), & 1<t<2 \\ \frac{1}{L}(3-t), & 2<t<3 \\ 0, & \text{otherwise} \end{cases}$$



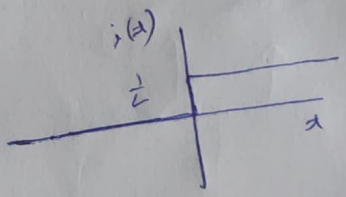
(b) $$i = \begin{cases} 0 & t<0 \\ \frac{1}{L}t^2 & 0<t<0.5 \\ \frac{1}{L}(-t^2+2t-\frac{1}{2}) & 0.5<t<1 \\ \text{For } 1<t<2 \text{ same curve from 0, 1 time shifted by 1 and vertically by } \frac{1}{2L} & \\ \frac{1}{L} & 2<t \end{cases}$$



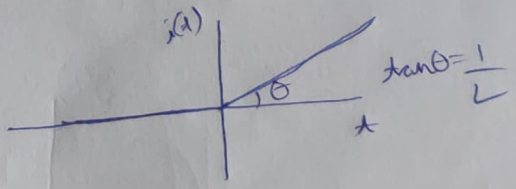
(c) $$i = \begin{cases} \frac{1-\cos(t)}{L} & 0<t<\pi \\ \frac{2}{L} & \pi<t \end{cases}$$



(d) $$i = \begin{cases} 0 & t<0 \\ \frac{1}{L} & 0<t \end{cases}$$



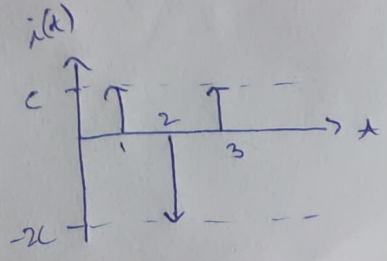
(e) $$i = \begin{cases} 0 & t<0 \\ \frac{t}{L} & 0<t \end{cases}$$



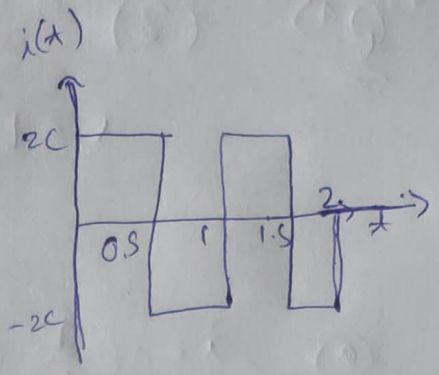
$\Rightarrow$ Capacitor

$$i = C\frac{dV}{dt}$$

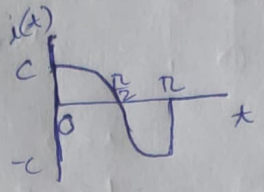
(a) $$i = C(\delta(t-1) - 2\delta(t-2) + \delta(t-3))$$



(b) $i = \begin{cases} 2C, & 0 < t < 0.5 \\ -2C, & 0.5 < t < 1 \\ 2C, & 1 < t < 1.5 \\ -2C, & 1.5 < t < 2 \\ 0, & \text{otherwise} \end{cases}$

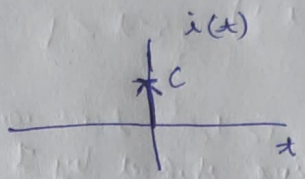


(c) $i = \begin{cases} C\cos(t) & 0 < t < \pi \\ 0, & \text{otherwise} \end{cases}$



(d) $i = C\,\dot{\delta}(t)$

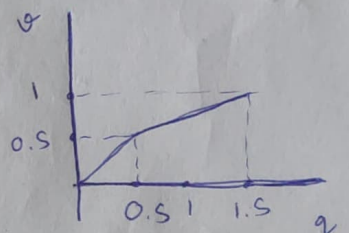
(e) $i = C\,\delta(t)$



Q2> PART (1) CAPACITOR

Characteristics

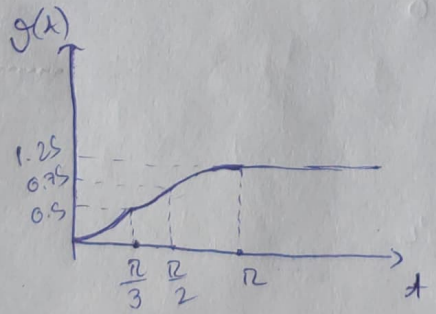
$$q = \int_0^t i\,dt = 1 - \cos(t)$$



For $0 < t < \frac{\pi}{3}$ $\quad q < 0.5 \Rightarrow v = q = 1 - \cos(t)$

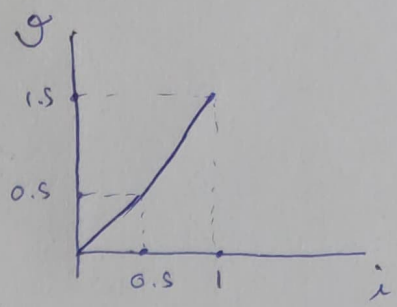
$\frac{\pi}{3} < t < \pi$ $\quad q > 0.5 \Rightarrow v = \frac{q}{2} + \frac{1}{4} = \frac{1}{2} - \frac{\cos(t)}{2} + \frac{1}{4}$

$$= \frac{3}{4} - \frac{\cos(t)}{2}$$



PART (2) RESISTOR

Characteristics



$i = \sin(t)$

For $0 < t < \frac{\pi}{6}$ $\quad i < 0.5$

$\Rightarrow v = i = \sin(t)$

For $\frac{\pi}{6} < t < \frac{5\pi}{6}$ $\quad i > 0.5$

$\Rightarrow v = 2i - 0.5 = 2\sin(t) - \frac{1}{2}$

For $t > \frac{5\pi}{6}$ $\quad i < 0.5$

$\Rightarrow v = i = \sin(t)$