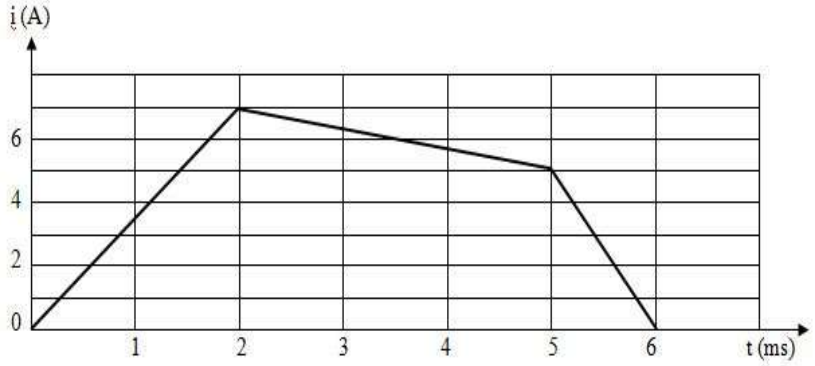
Q4. A current *i* through a 0.5 H inductor vary with time *t* as shown by the graph below.



Find the magnitude of the induced emf from the time interval
(a) t = 0 to t = 2 ms. You can ignore the behavior at the ends of the intervals.

During this interval the current increases in the inductor from zero to 7 A and hence the rate of change of current is given by

$$\frac{\Delta I}{\Delta t} = \frac{7A}{2*10^{-3}s} = 3.5*10^{3}\,A/s$$

Hence induced EMF will be

$$\varepsilon = -L\frac{dI}{dt} = -0.5*3.5*10^{3} = -1750V$$

The negative sign is according to the direction given by Lenz law.

(b) t = 2 to t = 5 ms.

During this interval the current decreases in the inductor from 7 A to 5 A and hence the rate of change of current is given by

$$\frac{\Delta I}{\Delta t} = \frac{-2A}{3*10^{-3}s} = -666.67\,A/s$$

Hence induced EMF will be

$$\varepsilon = -L\frac{dI}{dt} = 0.5*666.67 = 333.33V$$

(c) t = 5 to t = 6 ms.

During this interval the current decreases in the inductor from 5 A to zero and hence the rate of change of current is given by

$$\frac{\Delta I}{\Delta t} = \frac{-5A}{1*10^{-3}s} = -5000\,A/s$$

Hence induced EMF will be

$$\varepsilon = -L\frac{dI}{dt} = 0.5*5000 = 2500V$$