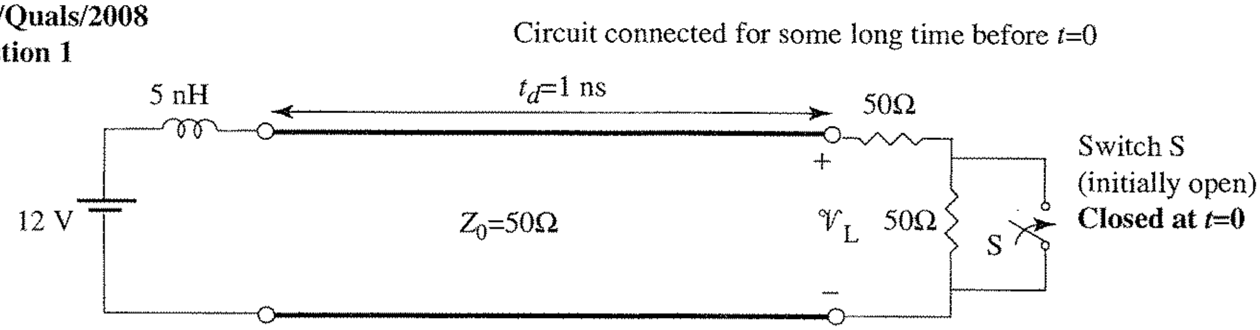
Inan/Quals/2008
Question 1



Determine and sketch the load voltage $\mathcal{V}_L(t)$

Answer: Initially, $\mathcal{V}_L(t)$ is 12 V. The switch closure launches a negative voltage wave towards the source, which is reflected at source end by the inductor (acting initially as open circuit).
The voltage $\mathcal{V}_L(t)$ thus drops at t=0, and then drops again at t=2 ns, after which time it rises exponentially (as the inductor now charges) back to 12 V.
The time constant of the charging is L/Z_0=0.1 ns.

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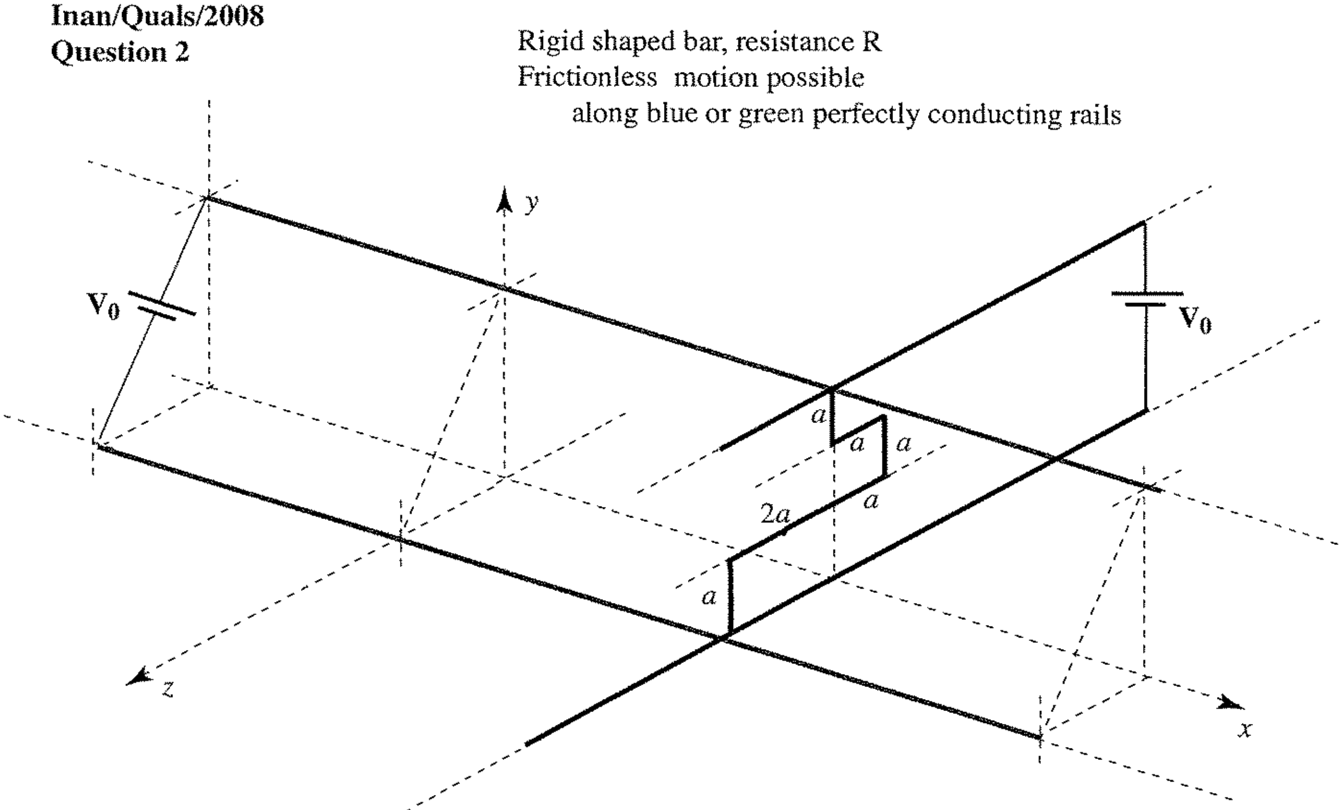
Question 2



Determine direction & speed of motion (at steady state) for constant (same everywhere) magnetic field:

a) $\boldsymbol{B} = \mathbf{a}_x B_0$ **Answer:** $+z$-direction
b) $\boldsymbol{B} = \mathbf{a}_y B_0$ **Answer:** $-x$-direction
c) $\boldsymbol{B} = \mathbf{a}_z B_0$ **Answer:** $-x$-direction

Answer: The eventual speed of motion is determined by equating the induced emf to $\mathbf{V_0}$, e.g.,
(a) emf= Integral [(v x B)·dl]= v B_0 (3a) = $\mathbf{V_0}$