Rotating loop in a static magnetic field. Fig. Q6.9 shows a circular loop that rotates with a constant angular velocity ω about its axis in a uniform time-invariant magnetic field of flux density B. The vector $\mathbf{B}$ is perpendicular to the plane of drawing. With $\mathcal{E}_0$ being a positive constant and $T = 2\pi/\omega$, the induced emf in the loop is of the following form:

(A) $e_{\text{ind}}(t) = \mathcal{E}_0 \cos \omega t$.
(B) $e_{\text{ind}}(t) = \mathcal{E}_0(1 - \mathrm{e}^{-t/T})$.
(C) $e_{\text{ind}}(t) = \mathcal{E}_0 t/T$.
(D) $e_{\text{ind}}(t) = -\mathcal{E}_0$.
(E) $e_{\text{ind}}(t) = 0$.

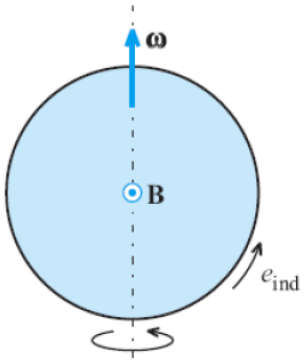

Figure Q6.9 Loop rotating in a uniform time-invariant magnetic field; for Question 6.21.

Solution: (A)
Answer: (A)