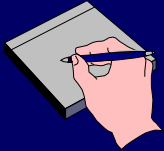


# Example

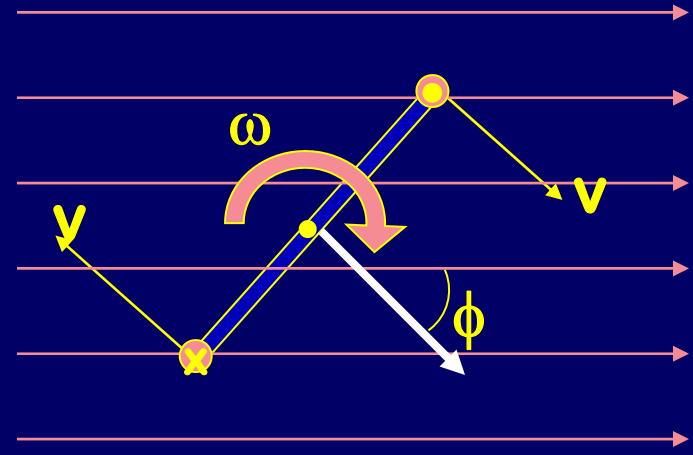


# Generator

A generator consists of a square coil of wire with 40 turns, each side is 0.2 meters long, and it is spinning with angular velocity  $\omega = 2.5$  radians/second in a uniform magnetic field  $B=0.15$  T. Calculate the maximum EMF and torque if the resistive load is  $4\Omega$ .

$$\begin{aligned}\epsilon &= \mathbf{NA B \omega \sin(\phi)} \\ &= \mathbf{(40) (0.2)^2 (0.15) (2.5)} \\ &= \mathbf{0.6 \text{ Volts}}\end{aligned}$$

$$\begin{aligned}\tau &= \mathbf{NI A B \sin(\phi)} \\ &= \mathbf{N^2 \omega A^2 B^2 \sin^2(\phi)/R} \\ &= \mathbf{(40)^2 (2.5) (0.2)^4 (0.15)^2/4} \\ &= \mathbf{0.036 \text{ Newton-meters}}\end{aligned}$$



Note: Emf is maximum at  $\phi=90$

Note: Torque is maximum at  $\phi=90$