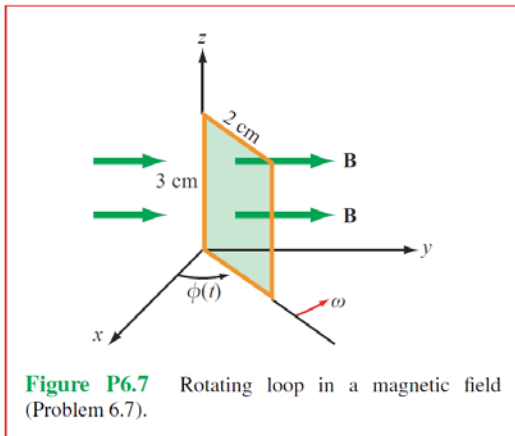HW3 due to 10/26 (submit online at NTUCOOL before 9 am)

1.

6.7 The rectangular conducting loop shown in Fig. P6.7 rotates at 3,000 revolutions per minute in a uniform magnetic flux density given by

$$B = \hat{y}\,50 \quad (mT).$$

Determine the current induced in the loop if its internal resistance is 0.5 Ω.

Figure P6.7 Rotating loop in a magnetic field (Problem 6.7).

2.

6.15 The plates of a parallel-plate capacitor have areas of 10 cm² each and are separated by 1 cm. The capacitor is filled with a dielectric material with $\varepsilon = 4\varepsilon_0$, and the voltage across it is given by $V(t) = 30\cos 2\pi \times 10^6 t$ (V). Find the displacement current.

4. CST simulation. Two spheres with radius of 1 cm and relative permittivity of 1 are placed with a distance of 4 cm. Sphere 1 has a total charge of -10⁻⁵C distributed over the surface and Sphere 2 has a total charge of 10⁻⁵C distributed over the surface. Plot the cross section view (yz plane) of electrical field and electrical flux density in terms of vector and absolute value.