1. A square loop lies in the xy-plane forming the closed path C connecting the points $(0,0,0),(1,0,0),(1,1,0),(0,1,0)$,and $(0,0,0)$, in that order. A magnetic field $\mathbf{B}$ exists in the region. From considerations of Lenz's law, determine whether the induced emf around the closed path C at $t=0$ is positive, negative, or zero for each of the following magnetic fields, where B_0 is a positive constant: (a) $\mathbf{B} = B_0 t \mathbf{a}_z$; (b) $\mathbf{B} = B_0 \cos(2\pi t + 60°)\mathbf{a}_z$; (c) $\mathbf{B} = B_0 e^{-t^2}\mathbf{a}_z$.

2. A rigid rectangular loop of base b and height h situated normal to the xy-plane and with its sides pivoted to the z-axis revolves around teh z-axis with angular velocity ω rads/s in the sense of increasing ϕ. Find the induced emf around the closed path C of the loop for each of the following magnetic fields: (a) $\mathbf{B} = B_0 \mathbf{a}_y$ Wb/m^2 and (b) $\mathbf{B} = B_0(y\mathbf{a}_x - x\mathbf{a}_y)$ Wb/m^2. Assume the loop to be in the xz-plane at $t=0$.

3. A magnetic field is given in the xz-plane by $\mathbf{B} = B_0 \cos \pi(x - v_0 t)\mathbf{a}_y$ Wb/m^2. Consider a rigid square loop situated in the xz-plane with its vertices at $(x,0,1),(x,0,2)$, and $(x+1,0,1)$. (a) Find the expression for the emf induced around the loop in the sense defined by connecting the above points in succession. (b) What would be the incduced emf if the loop is moving with the velocity $\mathbf{v} = v_0 \mathbf{a}_x$ m/s instead of being stationary?