Solutions **Opti 501**

Problem 38)

$$\boldsymbol{A}(\boldsymbol{r},t)=-\tfrac{1}{4}\mu_o J_{so}\left\{\left[\int_{-\infty}^{\infty} Y_o\left(k_o\sqrt{x^2+y'^2}\right)\mathrm{d}y'\right]\sin(\omega t)+\left[\int_{-\infty}^{\infty} J_o\left(k_o\sqrt{x^2+y'^2}\right)\mathrm{d}y'\right]\cos(\omega t)\right\}\hat{\boldsymbol{z}}$$

G&R **6.677**−3,4 →

$$=-\frac{1}{2}\mu_o J_{so}\left[\frac{\sin(k_o x)}{k_o}\sin(\omega t)+\frac{\cos(k_o x)}{k_o}\cos(\omega t)\right]\hat{\boldsymbol{z}} \rightarrow \boldsymbol{A}(\boldsymbol{r},t)=-\frac{\mu_o J_{so}}{2k_o}\cos(k_o x-\omega t)\hat{\boldsymbol{z}}.$$

$$\boldsymbol{E}(\boldsymbol{r},t)=-\frac{\partial \mathbf{A}(\boldsymbol{r},t)}{\partial t}=\frac{\mu_o J_{so}\,\omega}{2k_o}\sin(k_o x-\omega t)\hat{\boldsymbol{z}}=\tfrac{1}{2}Z_o J_{so}\sin(k_o x-\omega t)\hat{\boldsymbol{z}}.$$

$$\boldsymbol{B}(\boldsymbol{r},t)=\nabla\times\boldsymbol{A}(\boldsymbol{r},t)=-\frac{\partial A_z(\boldsymbol{r},t)}{\partial x}\hat{\boldsymbol{y}} \rightarrow \boldsymbol{H}(\boldsymbol{r},t)=-\tfrac{1}{2}J_{so}\sin(k_o x-\omega t)\hat{\boldsymbol{y}}.$$