

Q.

A truncated cone with its vertex at origin ($a < r < b$; $\theta = \theta_0, 0 < \varphi < 2\pi$), as shown in the figure, has a surface current density $\bar{K}_s = K_o \hat{a}_\varphi$ (K_o is a constant). Using Biot-Savart's law given by:

$$\bar{H} = \int_s \frac{\bar{K} \times (\bar{r} - \bar{r}')}{4\pi |\bar{r} - \bar{r}'|^3} ds'$$

Derive the expression for the magnetic field intensity at the origin. Show all steps in the derivation including the determination of the vectors $\bar{r}$, $\bar{r}'$, $\bar{K} \times (\bar{r} - \bar{r}')$ and the scalars $|\bar{r} - \bar{r}'|$ and ds' .

