Date __/__/__

Example 1

A Plane - - - - - - - - - this - - point?

Solution:-

$$B = \frac{E}{c}$$

or Magnitude $B = \frac{6.3\ V/m}{3\times10^8\ m/s} = 2.1\times10^{-8}\ T$

To find the direction; we note that E is along y-direction and the wave propogates along x-axis. Therefore B, should be in a direction perpendicular to both x- and y- axes. Using vector algebra, E x B should be along x-direction. Since $(+\hat{j})\times(+\hat{k}) = \hat{i}$, B is along the z-direction. thus

$$B = 2.1\times10^{-8}\hat{k}\ T$$

Example - 8.2 (2)

The magnetic field - - - - - - - wave is given -

Solution:-

(a) Comparing the given equation with

$$B_y = B_0 \sin\left[2\pi\left(\frac{x}{\lambda}+\frac{t}{T}\right)\right]$$

We get $\lambda = \frac{2\pi}{0.5\times10^3}\ m = 1.26\ cm$.

and $\frac{1}{T} = \nu$

$$= \frac{(1.5\times10^{11})}{2\pi} = 23.9\ GHz$$ Ans

(b) $E_0 = B_0 c$,

$= 2\times10^{-7}\ T\times3\times10^8\ m/s$

$= 6\times10^1\ Vm^{-1}$

$= 60\ Vm^{-1}$

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The electric field component is perpendicular to the direction of propagation and the direction of magnetic field. Therefore, the electric field component along with the z-axis is obtained as

$$E_z = 60 \sin(0.5 \times 10^3 x + 1.5 \times 10^{11} t) \ V/m.$$