1

NCERT 12.8 8

EE23BTECH11054 - Sai Krishna Shanigarapu

Question 8

Suppose that the electric field amplitude of an electromagnetic wave is $E_0 = 120$ N/C and that its frequency is f = 50.0 MHz.

- (a) Determine, B_0, ω, k and λ
- (b) Find expressions for ${\bf E}$ and ${\bf B}$

Solution:

TABLE I Input Parameters

Symbol	Description value	
f	frequency of source	50.0 MHz
E_0	Electric field am- plitude	120 N/C
С	speed of light	3 x 10 ⁸ m/s
$\mathbf{e}_2,\mathbf{e}_3$	Standard Basis vectors	N/A

Fig. 1. Graphs of E and B

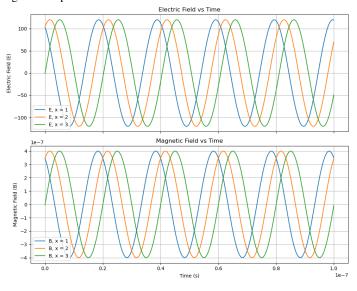


TABLE II Formulae and Output

Symbol	Description	Formula	Value
E	Electric field vector	$E_0 \sin(kx - 2\pi f t)\mathbf{e_2}$	$ 120 \sin[1.05x - 3.14x10^8 t] \mathbf{e_2} $
В	Magnetic field vector	$B_0\sin(kx-2\pi ft)\mathbf{e_3}$	$(4x10^{-7})\sin[1.05x - 3.14x10^8t]$ e ₃
B_0	Magnetic field strength	$\frac{E_0}{c}$	400nT
ω	Angular frequency	$2\pi f$	3.14 x 10 ⁸ m/s
k	Propagation constant	$\frac{2\pi f}{c}$	1.05rad/s
λ	Wavelength	$\frac{c}{f}$	6.0m