NCERT 12.8 Q4

## EE23BTECH11014 - Devarakonda Guna Vaishnavi

Question: A plane electromagnetic wave travels in vacuum along the z-direction. What can you say about the directions of its electric ($\mathbf{E}$) and magnetic ($\mathbf{B}$) field vectors? If the frequency of the wave is $30\,\mathrm{MHz}$, what can you say about its wavelength?

Solution:

Symbol	Description	Value
c	Speed of light in vacuum	3×10^8 m/s
f	Frequency of the electromagnetic wave	30 MHz
λ	Wavelength of the electromagnetic wave	?

TABLE 0
INPUT PARAMETERS
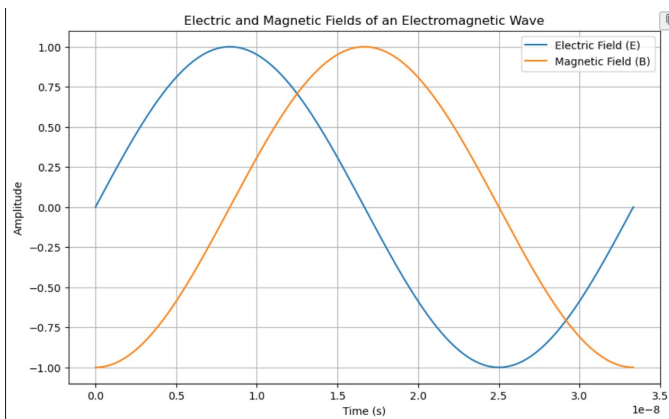
a) A plane electromagnetic wave travels in vacuum along the z-direction. The electric ($\mathbf{E}$) and magnetic ($\mathbf{B}$) field vectors are perpendicular to each other move in x and y direction respectively and they are perpendicular to each other

b)The relationship between frequency (f), wavelength (λ), and the speed of light (c) is given by the formula:

$$\lambda = \frac{c}{f} \tag{1}$$

$$\lambda = \frac{3 \times 10^8 \,\mathrm{m/s}}{30 \times 10^6 \,\mathrm{Hz}} \tag{2}$$

$$= 10\,\mathrm{m} \tag{3}$$

$$\implies \lambda = 10m$$