Assignment
12.8 - 6

EE23BTECH11034 - Prabhat Kukunuri

QUESTION

A charged particle oscillates about its mean equilibrium position with a frequency of $10^9 Hz$. What is the frequency of the electromagnetic waves produced by the oscillator?

SOLUTION

An oscillating charged particle in space produces electromagnetic waves. The frequency of the generated electromagnetic waves is equal to the frequency of the oscillating charged particle.

$$f = f_{osc} \tag{1}$$

The oscillating frequency of charged particle is $10^9 Hz$

$$f = 10^9 Hz \tag{2}$$

The frequency of the electromagnetic waves produced by the oscillator is $10^9 Hz$.
The equation for amplitude of electromagnetic wave is of the form

$$y = \cos\left(2\pi f_c \times t\right) \tag{3}$$

Fig. 0. Amplitude *vs* Time

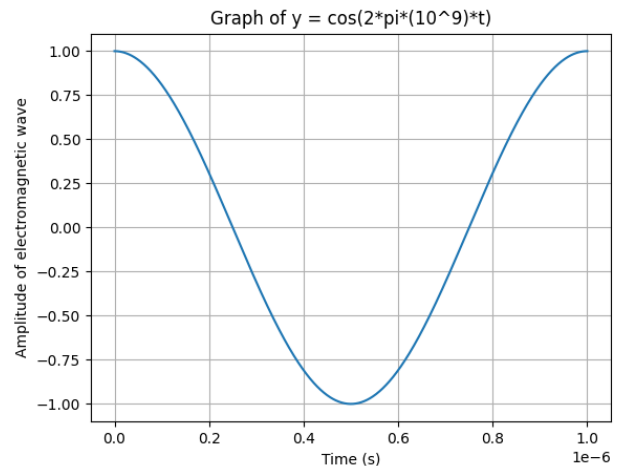| Symbol	Value	Description
f_c	10^9	frequency of electromagnetic wave
y	time dependent	amplitude of electromagnetic wave

TABLE 0
VARIABLE DESCRIPTION

For the electro-magnetic wave generated due to oscillation charged particle amplitude is related to time by

$$y = \cos\left(2 \times 10^9 \pi t\right) \tag{4}$$

Plotting the amplitude of the electromagnetic wave as a function of time