Gate Assignment 4

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Download all latex-tikz codes from

https://github.com/V−gopireddy/EE3900/blob/main/GATE_Assignment4/GateAssignment−4.tex

1 EC-1998/Q2.23

The Fourier transform of a voltage signal $x(t)$ is $X(f)$. The unit of $|X(f)|$ is

1) volt
2) volt-sec
3) volt/sec
4) volt^2

2 Solution

Definition 1 (Fourier Transform)**.** *It is a mathematical transform that decomposes functions depending on space or time into functions depending on spatial or temporal frequency. The fourier transform of a given signal x(t) is denoted by $\mathcal{F}\{x(t)\}$ or X(f)*

$$X(f) = \mathcal{F}\{x(t)\} = \int_{-\infty}^{\infty} e^{j2\pi ft} x(t)dt \tag{2.0.1}$$

Given $x(t)$ is a voltage signal.Therefore the unit of x(t) is volt.
We have,

$$X(f) = \int_{-\infty}^{\infty} e^{j2\pi ft} x(t)dt \tag{2.0.2}$$

The unit of $X(f)$ will be the product of unit of $x(t)$, unit of dt. Since $e^j 2\pi ft$ have no units.
Therefore the units of $X(f)$ will be volt-sec.