

UNIT – III FOURIER SERIES

Fourier series

Suppose that a given function $f(x)$ defined in $[-\pi, \pi]$ (or) $[0, 2\pi]$ (or) in any other interval can be expressed as

$$f(x) = \frac{a_0}{2} + \sum_{n=1}^{\infty} (a_n \cos nx + b_n \sin nx)$$

The above series is known as the Fourier series for $f(x)$ and the constants a_0, a_n, b_n ($n=1, 2, 3, \dots$) are called Fourier coefficients of $f(x)$

Periodic Function:-

A function $f(x)$ is said to be periodic with period $T > 0$ if for all x , $f(x+T) = f(x)$, and T is the least of such values

Example:- (1) $\sin x = \sin(x+2\pi) = \sin(x+4\pi) = \dots$ the function $\sin x$ is periodic with period 2π . There is no positive value T , $0 < T < 2\pi$ such that $\sin(x+T) = \sin x \forall x$

(2) The period of $\tan x$ is π

(3) The period of $\sin nx$ is $\frac{2\pi}{n}$ i.e. $\sin nx = \sin n\left(\frac{2\pi}{n} + x\right)$

Euler's Formulae:-

The Fourier series for the function $f(x)$ in the interval $C \leq x \leq C + 2\pi$ is given by

$$f(x) = \frac{a_0}{2} + \sum_{n=1}^{\infty} (a_n \cos nx + b_n \sin nx)$$

Where $a_0 = \frac{1}{\pi} \int_C^{C+2\pi} f(x) dx$

$$a_n = \frac{1}{\pi} \int_C^{C+2\pi} f(x) \cos nx \cdot dx \text{ and}$$

$$b_n = \frac{1}{\pi} \int_C^{C+2\pi} f(x) \sin nx \cdot dx$$

These values of a_0, a_n, b_n are known as Euler's formulae

Corollary:- If $f(x)$ is to be expanded as a Fourier series in the interval $0 \leq x \leq 2\pi$, put $C = 0$ then the formulae (1) reduces to

$$a_0 = \frac{1}{\pi} \int_0^{2\pi} f(x) dx \quad a_n = \frac{1}{\pi} \int_0^{2\pi} f(x) \cos nx \cdot dx$$

$$b_n = \frac{1}{\pi} \int_0^{2\pi} f(x) \sin nx \cdot dx$$

Corollary 2:- If $f(x)$ is to be expanded as a Fourier series in $[-\pi, \pi]$ put $C = -\pi$, the interval becomes $-\pi \leq x \leq \pi$ and the formulae (1) reduces to

Fourier Transform Of Engineering Mathematics Solved Problems

Lauren Gardner



Fourier Transform Of Engineering Mathematics Solved Problems:

The book delves into Fourier Transform Of Engineering Mathematics Solved Problems. Fourier Transform Of Engineering Mathematics Solved Problems is an essential topic that needs to be grasped by everyone, from students and scholars to the general public. This book will furnish comprehensive and in-depth insights into Fourier Transform Of Engineering Mathematics Solved Problems, encompassing both the fundamentals and more intricate discussions.

1. The book is structured into several chapters, namely:
 - Chapter 1: Introduction to Fourier Transform Of Engineering Mathematics Solved Problems
 - Chapter 2: Essential Elements of Fourier Transform Of Engineering Mathematics Solved Problems
 - Chapter 3: Fourier Transform Of Engineering Mathematics Solved Problems in Everyday Life
 - Chapter 4: Fourier Transform Of Engineering Mathematics Solved Problems in Specific Contexts
 - Chapter 5: Conclusion
 2. In chapter 1, this book will provide an overview of Fourier Transform Of Engineering Mathematics Solved Problems. This chapter will explore what Fourier Transform Of Engineering Mathematics Solved Problems is, why Fourier Transform Of Engineering Mathematics Solved Problems is vital, and how to effectively learn about Fourier Transform Of Engineering Mathematics Solved Problems.
 3. In chapter 2, the author will delve into the foundational concepts of Fourier Transform Of Engineering Mathematics Solved Problems. The second chapter will elucidate the essential principles that need to be understood to grasp Fourier Transform Of Engineering Mathematics Solved Problems in its entirety.
 4. In chapter 3, the author will examine the practical applications of Fourier Transform Of Engineering Mathematics Solved Problems in daily life. This chapter will showcase real-world examples of how Fourier Transform Of Engineering Mathematics Solved Problems can be effectively utilized in everyday scenarios.
 5. In chapter 4, this book will scrutinize the relevance of Fourier Transform Of Engineering Mathematics Solved Problems in specific contexts. This chapter will explore how Fourier Transform Of Engineering Mathematics Solved Problems is applied in specialized fields, such as education, business, and technology.
 6. In chapter 5, the author will draw a conclusion about Fourier Transform Of Engineering Mathematics Solved Problems. The final chapter will summarize the key points that have been discussed throughout the book.
- This book is crafted in an easy-to-understand language and is complemented by engaging illustrations. It is highly recommended for anyone seeking to gain a comprehensive understanding of Fourier Transform Of Engineering Mathematics Solved Problems.

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