**Lecture One**

**1.1 Fourier series**

Fourier series: is trigonometric function series of the form

**Fourier series Formula:**

where the Fourier coefficients a0, an and bn are called constant the Euler coefficients

to find coefficients: -

1)a0=we integrate equation

2) an =multiply equation (1) by cos mx

3) bn= multiply equation (1) by sin mx

**Example 1: Find the Fourier series representation peroidc function**

**Solution//**

**1)**

**2)**

**1.2 Dirichlet’s Theorem.**

If f(x) is aperiodic function at which at any period has finite number.

**Example 1: Find the Fourier series representation peroidc function**

Solution//

**1)**

**2)**

**1.3 Even and Odd Functions "Half-Range Expansions**

A half range Fourier sine or cosine series is a series in which only sine terms or only cosine terms are present, respectively. When a half range series corresponding to a given function is desired, the function is generally defined in the interval (0,L) which is half of the interval(-L,L) thus accounting for the name half range] and then the function is specified as odd or even, so that it is clearly defined in the other half of the interval, namely,(-L,0).

**Note:-**

**1.** An odd function is a function with the property f (− x) = − f (x). For example :

1.f(x)= . let x = -1, then = -

2. f (x) = sin (x). let x = - π/2, then sin (-π/2) = - sin (π/2).

Let us calculate the Fourier coefficients of an odd function: a0=an =0 but bn ≠0

**2.** An even function is a function with the property f (−x) = f (x). The sine coefficients of a Fourier series will be zero for an even function, For example : 1.f(x)= . let x = -1, then =

2. f (x) = cos (x). let x = - π, then cos (-π) = cos (π).

Let us calculate the Fourier coefficients of an even function: bn =0, but ao,an ≠0

**1.4 Complex Fourier series**

The complex exponential of Fourier series is obtained by substitution the exponential equivalent of the Cosine and Sine into the original form of Series

If we define

The coefficients  are called complex Fourier coefficients. They are defined by the formulas

**Example 1:** Using complex form, find the Fourier series of the function

**Solution//**

**1)**

2)

n==

**H.W. Example 1:** Using complex form, find the Fourier series of the function