**Definite Integral**

**Integration as the limit of a sum**

Let be a bounded continuous function defined in the interval , *a* and *b* being finite quantity and and let the interval be divided into *n* equal sub-intervals each of length , by the points

then

is defined as the definite integral of with respect to *x* between the limit *a* and *b* and is denoted by symbol

i,e

where *a* is called lower limit and *b* is called upper limit.

Note: is also represented as

Note: If

**Geometrical meaning**

The definition of definite integral in gemetrical approach is based on the concept of area under the curve y=f(x) and above the x-axis from *x=a* to *x=b*

y

C

y=f(x)

f(a+nh)

D

f(a+(n-1)h)

f(a)

f(x)

f(a+h)

f(a+2h)

A B

dx

x

x=a

b=a+nh

a+2h

a+h

a+(n-1)h

**Fig 1**

**Evaluate**  using summation

Soln:

, nh=1

Here

=  =

***Evaluate*** *using summation*

Soln

, *nh=b-a*

Here

]

, where

]

)

---------------

**Summation of series by definite integral**

,

,

**Evaluate**

Soln

==

=

=

**Evaluate**

Soln

==

=

=

**Evaluate**

Soln

==

==

Ans.

**Evaluate**

Soln

Let S=

=

= =

**Evaluate**

Soln

**Evaluate**

Soln

Put

When

**Evaluate**

Soln

Put

When

[2

**Evaluate**

Soln

,

where

**Properties of definite integral**

1.

2.

3. 

........

4. and

**Proof : Let** x=a+b-z dx=-dz when x=a, z=b when x=b, z=a

=

**proved**

If a=0 b=1 then 

**Evaluate**

Soln

Let I=I

**Evaluate**

Soln

I

Put

When

Ans.

**Evaluate** ,

Soln

, where

put

**Evaluate**

Soln

=

**Evaluate**

Soln

**Evaluate**

Soln

5.

**Proof :** 

Now , put

When

=

=

=2 , if

Again

=

=

=0 if

Hence

6.

**Proof**:

Now put

When

if

if

Again



if

Example

Here

Example

Here