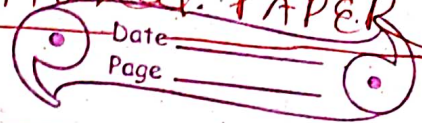


B.Sc Part III
PAPER - VIII

Optional PAPER



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Finite difference operator
Some definitions:

1) Argument and Entry: Let $y = f(x)$ be a function of x . The independent variable x is called argument of function. The value of function $f(x)$ is called entry.

For example let us have a table of data (1.1)

x :	45	50	55	60	← Arguments of function
$f(x)$:	2.8	2.4	2	1.8	← Entries of function

Interval of Differencing

The difference between consecutive values of the argument ' x ' is called the interval of differencing.

For example x : a $a+h$ $a+2h$
 y : y_a y_{a+h} y_{a+2h}

Here interval of differencing is h

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In example of table 1.1 interval of difference is 5.

3. Forward Difference : Let $y = f(x)$ be the function of x . The forward difference of $f(x)$ is denoted by $\Delta f(x)$ and is defined by

$$\Delta f(x) = f(x+h) - f(x)$$

Here h is the interval of difference. ' Δ ' is called the forward difference operator.

For example.

Argument	Entry	First difference	Second difference
x	y		
a	y_a	$y_{a+h} - y_a = \Delta y_a$	$\Delta^2 y_a = \Delta y_{a+h} - \Delta y_a$
$a+h$	y_{a+h}	$y_{a+2h} - y_{a+h} = \Delta y_{a+h}$	$\Delta^2 y_{a+h} = \Delta y_{a+2h} - \Delta y_{a+h}$
$a+2h$	y_{a+2h}	$y_{a+3h} - y_{a+2h} = \Delta y_{a+2h}$	$\Delta^2 y_{a+2h} = \Delta y_{a+3h} - \Delta y_{a+2h}$
$a+3h$	y_{a+3h}		

The difference of the first forward difference are called second forward difference. It is denoted by $\Delta^2 y_a, \Delta^2 y_{a+h}$

Proceeding In general

$$\Delta^n f(x_i) = \sum_0^n (-1)^k \binom{n}{k} f_{i+n-k}$$