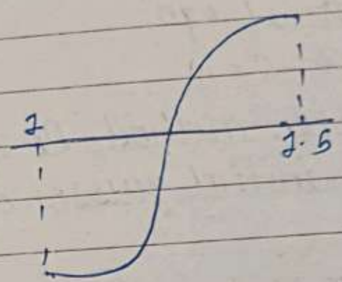
PRACTICAL NO: -	1
PRACTICAL NAME:-	**Bisection Method**
STUDENT NAME: -	Simran.V.Akhade
DIV & ROLL NO:-	**B(mech) - 04**

Sol^n of Algebric & Transdental Eq^n s :-
find Root of eq^n
$2x^3+4x^2-8=0$
Use bisection method Do 3 Iteration
Consider initial guesses as 1 & 1.5
Ans:
Data $y=f(x)=2x^3+4x^2-8=0$
Initial guess $x_1=1$
$x_2=1.5$
no. of Iteration $=3$
p1) Apply convergence criteria to check whether initial guess are accurate or not.
$y=f(x)=2x^3+4x^2-8=0$ —— ①
with x_1 as 1 put $x_1=1$ in eq ①
$\therefore y_1=f(x)=2\times1^3+4\times1^2-8=0$
$=2+4-8$
$[=-2$ Negative$]$
Similarly, put $x_2=1.5$ in eq ①
$\therefore y_2=f(x)=2\times1.5^3+4\times1.5^2-8=0$
$[=7.75$ Positive$]$

Now, from eq ② & ③ $y_1\times y_2=f(x_1)\times f(x_2)$
$f(x_1)\times f(x_2)=-2\times7.75=-15.5<0$
Hence, convergence criteria is satisfied

∴ Root of eqn will be calculated with initial gues

$x_1 = 1$, $x_2 = 1.5$



As per data,
we have to consider
bisection method
[i.e Bracketing Method]

$x_1 = 1$, $x_2 = 1.5$

① Iteration

$x_3 = \frac{x_1 + x_2}{2} = \frac{1 + 1.5}{2} = \boxed{1.25}$

$f(x_3) = 2 \times x^3 + 4 \times x^2 - 8 = 0$

$= 2 \times (1.25)^3 + 4 \times (1.25)^2 - 8$

$= 2.15$ [Positive]

② Iteration $x_1 = 1$ & $x_2 = 2.15$

$x_3 = \frac{x_1 + x_2}{2} = \frac{1 + 2.15}{2} = \boxed{1.125}$

$f(x) = 2 \times 1.125^3 + 4 \times 1.125^2 - 8$

$= -0.0898$ [Negative]

③ Iteration $x_1 = 1.25$ $x_2 = 1.125$

$x = \frac{x_1 + x_2}{2} = \frac{1.25 + 1.125}{2} = \boxed{1.1875}$

$f(x) = 2 \times x^3 + 4 \times x^2 - 8 = 0$

$= 2 \times (1.1875)^3 + 4 \times (1.1875)^2 - 8$

$= 0.98$ [Positive].

```
f = input('
x1 = input(
x2 = input(
n = input('
y1 = f(x1);
y2 = f(x2);

while (y1*y
    x1 = in
    x2 = in
    y1 = f
    y2 = f
end

for i = 1:
    x3 = (
    y3 = f
    if (yl
        x2
        y2
    else
        x1
        y1
    end
end

fprintf('\

Output

Bisection
enter func
@(x) (2*x
enter 1st
1
enter 1st
1.5
enter no
3
    The ro
```

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itial guess

1.5

Bisection Method

```
f = input('enter function y = f(x) = ');
x1 = input('enter 1st initial guess x1 = ');
x2 = input('enter 1st initial guess x2 = ');
n = input('enter no of iterations n = ');
y1 = f(x1);
y2 = f(x2);

while (y1*y2 > 0)
    x1 = input('enter 1st initial guess again  x1 = ');
    x2 = input('enter 1st initial guess again x2 = ');
    y1 = f(x1);
    y2 = f(x2);
end

for i = 1:n
    x3 = (x1+x2)/2;
    y3 = f(x3);
    if (y1*y3 < 0)
        x2 = x3;
        y2 = y3;
    else
        x1 = x3;
        y1 = y3;
    end
end

fprintf('\n The root of equation is = %f',x3);
```

Output

```
Bisection28B.mlx
enter function y = f(x) =
@(x) (2*x*x*x) + (4*x*x) - 8
enter 1st initial guess x1 =
1
enter 1st initial guess x2 =
1.5
enter no of iterations n =
3
   The root of equation is = 1.187500
```

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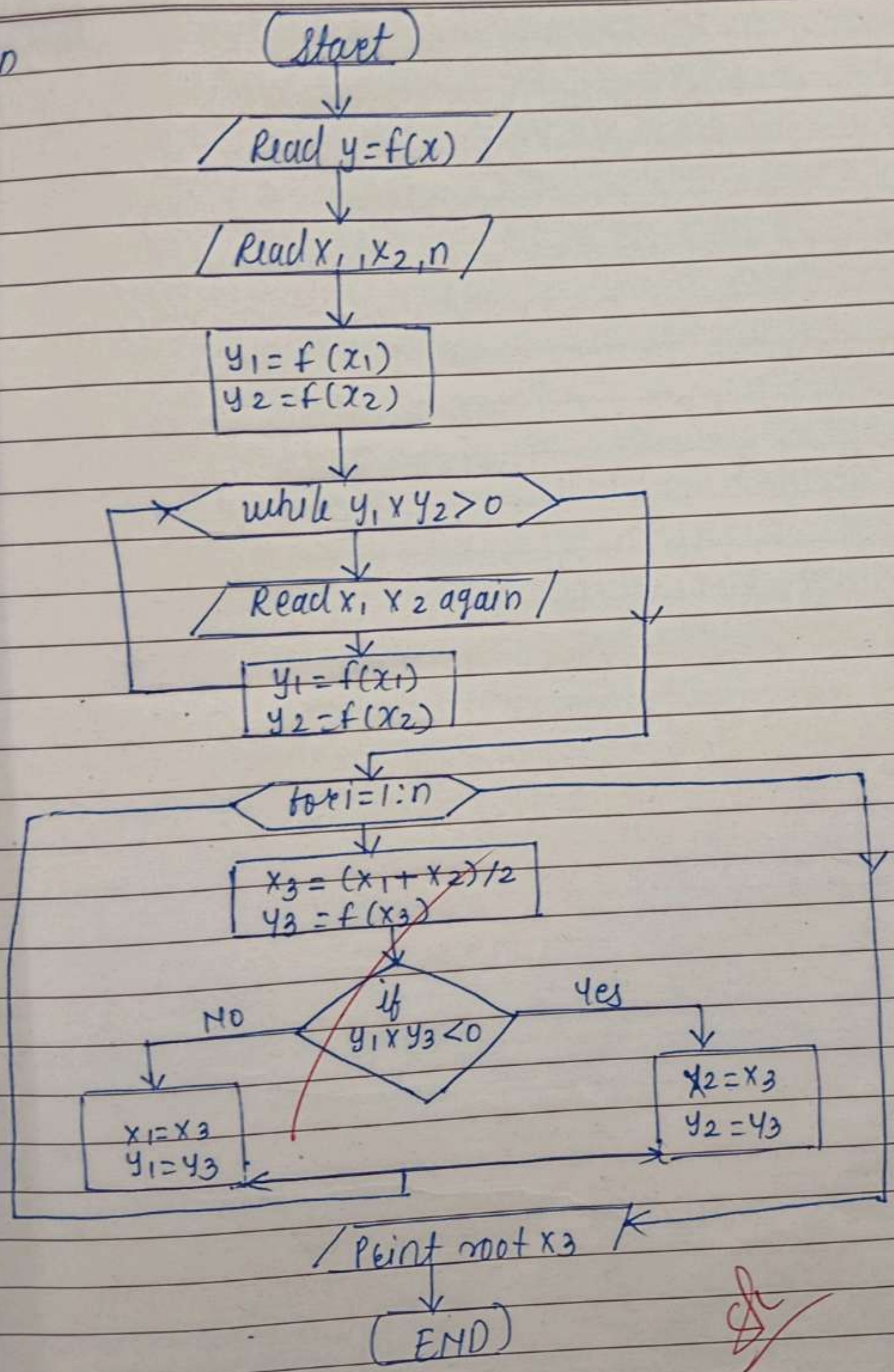
ection


Start
Read y=f(x)
Read x1, x2, n
y1 = f(x1)
y2 = f(x2)
while y1 x y2 > 0
Read x1, x2 again
y1 = f(x1)
y2 = f(x2)
for i=1:n
x3 = (x1 + x2)/2
y3 = f(x3)
if
y1 x y3 < 0
yes
NO
x2 = x3
y2 = y3
x1 = x3
y1 = y3
Print root x3
END

PRACTICAL NO:-	2
PRACTICAL NAME :-	NEWTON RAPHSON METHODS
STUDENT NAME :-	SIMRAN. V. AKHADE
DIV & ROLL NO :-	B(mech) - 04

Newton Raphson Methods

$y = f(x) = x^3 - 5x + 3$

ta $y = f(x) = x^3 - 5x + 3$

Initial guess $x_1 = 0$

No. of Iteration $= 3$

$y = f(x) = x^3 - 5x + 3$ —— ①

$y' = f'(x) = 3x^2 - 5$ —— ②

$y'' = f''(x) = 6x$ —— ③

$y = f(x) = x^3 - 5x + 3$

$= 0^3 - 5(0) + 3$

$y_1 = f(x_1) = 3$

$y_1' = f(x_1) = 3x^2 - 5$

$= 3(0)^2 - 5$

$y_1'' = f''(x) = 6x$

$= 6(0)$

$y_1'' = f''(x) = 0$

By Newton Raphason Method

Iteration I

$x_2 = x_1 - \frac{f(x_1)}{f'(x_1)}$

$\therefore x_2 = 0 - \frac{3}{-5}$

$x_2 = 0.6$

place x_1 by x_0

$x_1 = 0.6$

$= f(x_1) = x^3 - 5x + 3$

$= 0.6^3 - 5(0.6) + 3$

$= f(x) = 0.216$

$= f'(x) = 3x^2 - 5 = 3(0.6)^2 - 5$

$f'(x) = -3.92$

$= f''(x) = 6x = 6 \times 0.6$

$f''(x) = 3.6$

ation 2

$= x_1 - \frac{f(x_1)}{f'(x)}$

$x_2 = 0.6551$

lace x_1 by x_2

$= 0.6551$ substitute the value from eq ①②③

$= f(x) = x^3 - 5x + 3$

$= 0.6551^3 - 5(0.6551) + 3$

$= 0.0056$

$= f'(x) = 3x^2 - 5$

$= 3(0.6551)^2 - 5$

$= -3.7125$

$= f''(x) = 6x = 6 \times 0.6551$

$= 3.9306$

Iteration 3

$\therefore x_2 = x_1 - \frac{f(x)}{f'(x)}$

$x_2 = 0.6566$

ration	x_1	y_1	y'	x
1	0	3	-5	0.6
2	0.6	0.216	-3.92	0.6551
3	0.6551	0.B056	-3.7125	0.6566

The root of eq is 0.6, 0.6551 & 0.6566
Final root of eq is = 0.6566

```
input('enter function y = f(x) = ');
= input('enter 1st derivation = ');
lf = input('enter 2nd derivation = ');
= input('enter 1st initial guess x1 = ');
= input('enter no of iteration n = ');
= f(x1);
= df(x1);
= ddf(x1);
= (y1*y3)/(y2*y2);
hile (abs(a) > 1)
 x1 = input('enter 1st initial guess again x1 = ');
 y1 = f(x1);
 y2 = df(x1);
 y3 = ddf(x1);
 a = (y1*y3)/(y2*y2);
nd
or i = 1:n
 x2 = x1 - (y1/y2);
 fprintf('\n The root of equation is = %f',x2);
 x1 = x2;
 y1 = f(x1);
 y2 = df(x1);
end
fprintf('\n Final root of equation is = %f',x2);
```

OUTPUT

```
newtonraphson
enter function y = f(x) =
@(x) (x*x*x)-(5*x)+3
enter 1st derivation =
@(x) (3*x*x)-5
enter 2nd derivation =
@(x) (6*x)
```

enter 1st initial guess x1 =

0

enter no of iteration n =

3

The root of equation is = 0.600000
The root of equation is = 0.655102
The root of equation is = 0.656619
Final root of equation is = 0.656619

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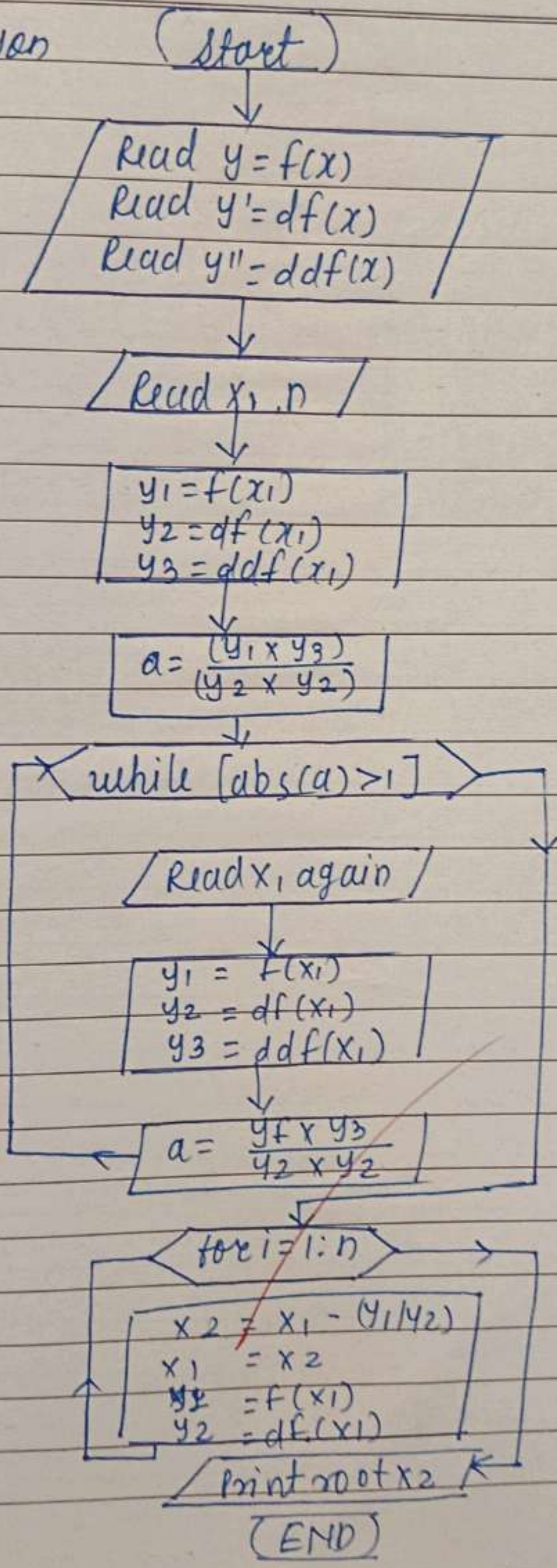
uton - Raphson
thod



PRACTICAL NO :-	3
PRACTICAL NAME :-	GAUSS ELIMINATION
STUDENT NAME :-	SIMRAN . V. AKHADE
DIV & ROLL NO :-	B(mech) - 04

Gauss elimination

Solve the following eq^n by gauss elimination

$x + 3y + 3z = 16$ —— ①

$x + 4y + 3z = 18$ —— ②

$x + 3y + 4z = 19$ —— ③

: Apply gauss elimination to solve eq as:

Convert given system of eq^ns into the matrix.

$(Ax = B)$

$$\begin{bmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 16 \\ 18 \\ 19 \end{bmatrix}$$

Convert this matrix into upper triangular matrix

$R_2 \rightarrow R_2 - R_1$

$$\begin{bmatrix} 1 & 3 & 3 \\ 0 & 1 & 0 \\ 1 & 3 & 4 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 16 \\ 2 \\ 19 \end{bmatrix}$$

$R_3 \rightarrow R_3 - R_1$

$$\begin{bmatrix} 1 & 3 & 3 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 16 \\ 2 \\ 3 \end{bmatrix}$$

Therefore we get,

$z = 3$ and

$y = 2$

Now, put value of $z=3$ & $y=2$ in eq

$$x + 3y + 3z = 16$$

$$x + (3 \times 2) + 3(3) = 16$$

we get $x = 1$

Ans:

$$\therefore \begin{bmatrix} z=3 \\ y=2 \\ x=1 \end{bmatrix}$$

```
Simran A
% Roll No
% Gauss

a = input('
b = input('
n = length(

% Upper T
for i = 1:n
  for k = i+
    f = a(k
    a(k,:) =
    b(k) =
  end
end

x = zeros(n,1

% Backward
for i = n:-1:1
  x(i) = (b(i) -
  fprintf('\nTh
end
OUTPUT
Enter matrix a:
[1,3,3;1,4,3;1,3,
Enter matrix b:
[16;18;19]

The value of x(3
```

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in eq

Simran Akhadet

```
% Roll No:04
% Gauss Elimination Method

a = input('Enter matrix a:'); % Coefficient matrix
b = input('Enter matrix b:'); % Constant Matrix
n = length(b);

% Upper Triangular Matrix
for i = 1:n
   for k = i+1:n
      f = a(k,i) / a(i,i); % Factor
      a(k,:) = a(k,:) - f * a(i,:);
      b(k) = b(k) - f * b(i);
   end
end

x = zeros(n,1);

% Backward Substitution
for i = n:-1:1
   x(i) = (b(i) - a(i,i+1:n) * x(i+1:n)) / a(i,i);
   fprintf('\nThe value of x(%d) = %f', i, x(i));
end
```

OUTPUT

```
Enter matrix a:
[1,3,3;1,4,3;1,3,4]
Enter matrix b:
[16;18;19]

The value of x(3) = 3.000000
The value of x(2) = 2.000000
The value of x(1) = 1.000000
```

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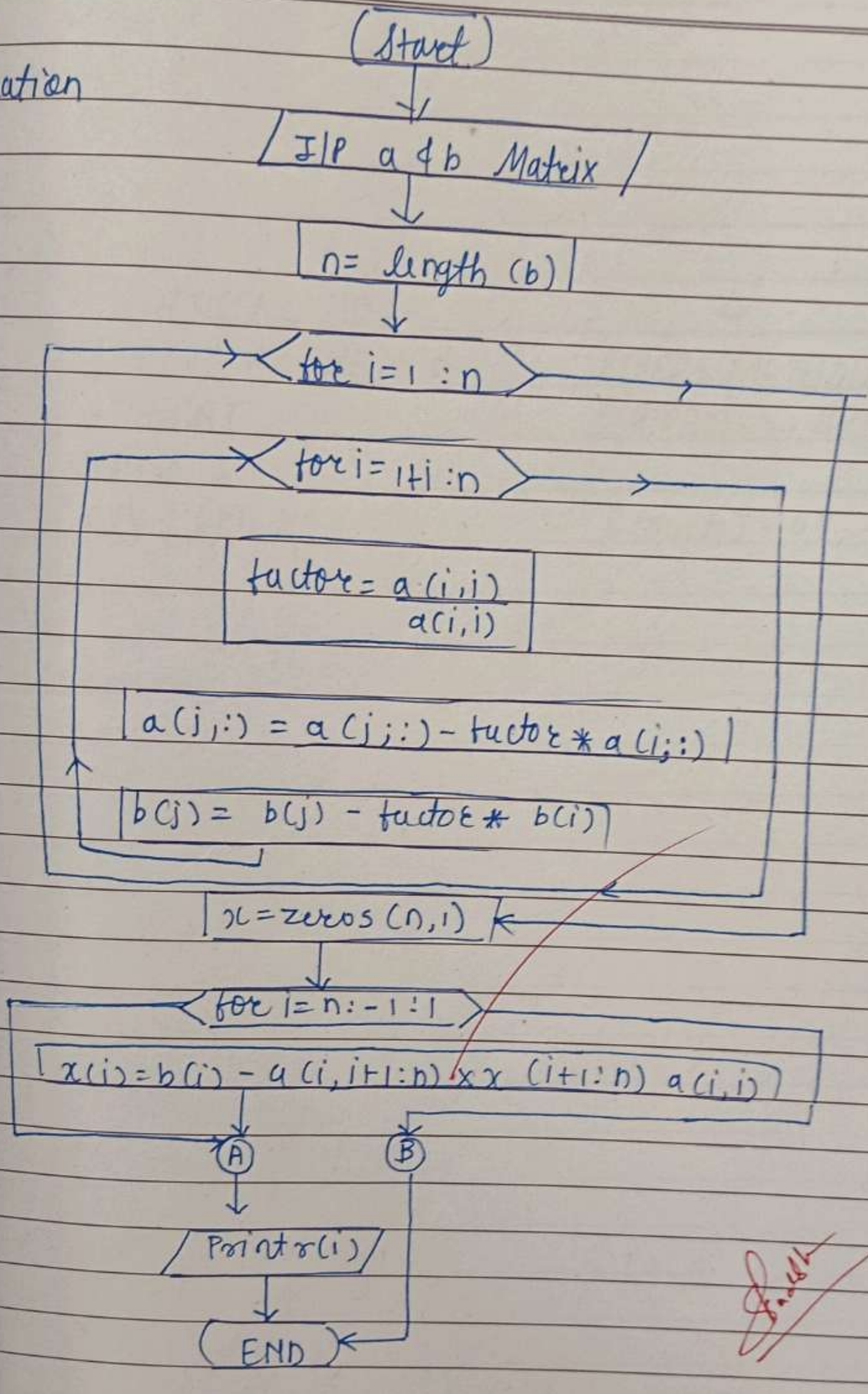
nination


Start
I/P a & b Matrix
n= length (b)
for i=1 :n
for j=1+i :n
factor= a(j,i) / a(i,i)
a(j,:) = a(j;:) - factor * a(i;:)
b(j) = b(j) - factor * b(i)
x=zeros(n,1)
for i=n:-1:1
x(i)=b(i) - a(i,i+1:n) x x (i+1:n) a(i,i)
A
B
Print x(i)
END

PRACTICAL NO :-	4
PRACTICAL NAME:-	EULERS METHOD
STUDENT NAME :-	SIMRAN . V . AKHADE.
DIV & ROLL NO :-	B (mech) - 04

Eulers Method

$\frac{dy}{dx} = x - y^2$ for given boundary condition that at $x_0 = 0$, $y_0 = 1$

find y_g at $x_g = 4$, Take step size $h = 1$

s: Data:- $\frac{dy}{dx} = x - y^2$

at $x_0 = 0$ $y_0 = 1$

$x_g = 4$ $y_g = ?$

Here $h = 1$

p1: Calculate no. of Iteration

$n = \frac{x_g - x_0}{h} = \frac{4-0}{1} = 4$

As per eular's method:-

$y_g = y_0 + h \times (f(x_0, y_0))$

teration 1: at $x_0 = 0$ $y_0 = 1$

$\therefore y_g = 1 + 1 \times f(x_0, y_0)$

$1 + 1 \times [0 - 1^2]$

$= 0$

where $x_1 = x_0 + h$

$x_1 = 0 + 1$

$x_1 = 1$

$x_1 = 1$ we get $y_1 = 0$

Iteration no: 2 Replace x_0 by x_1 & y_0 by y_1

Here $x_1 = 1$ $y_1 = 0$

$y_g = y_1 + h \times f(x_1, y_1)$

$y_g = 0 + 1 \times (1 - 0^2)$

$y_g = 1$

$x_2 = x_1 + h$

$x_2 = 1 + 1$

$x_2 = 2$

at $x_2 = 2$ we get $y_2 = 1$

Iteration 3: Replace x_1 by x_2 & y_1 by y_2

Here $x_2 = 2$ & $y_2 = 1$

$y_g = y_2 + h \times f[x_2, y_2]$

$y_g = 1 + 1 \times [2 - 1^2]$

$y_g = 2$

$x_3 = x_2 + h$

$x_3 = 2 + 1$

$x_3 = 3$

at $x_3 = 3$ we get $y_3 = 2$

Iteration 4: Replace x_2 by x_3 & y_2 by y_3

Here $x_3 = 3$ & $y_3 = 2$

$y_g = y_3 + h \times f[x_3, y_3]$

$= 2 + 1 \times [3 - 2^2]$

$y_g = 1$

$x_4 = x_3 + h$

$x_4 = 3 + 1$

$x_4 = 4$

at $x_4 = 4$ we get $y_g = 1$

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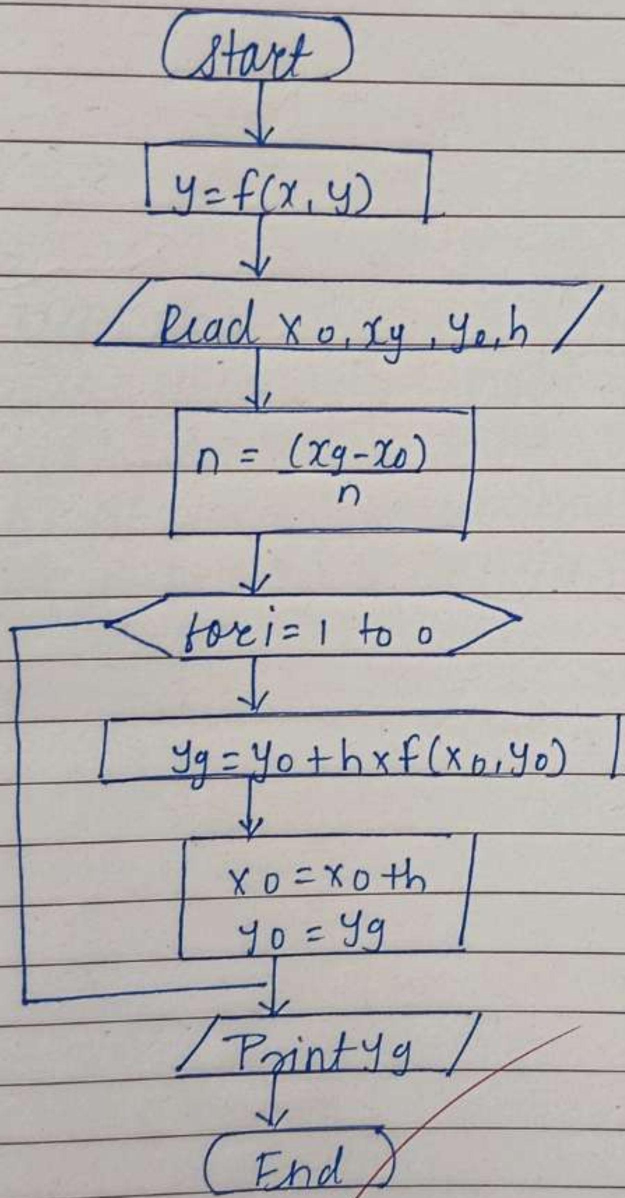
```
% Simran Akhade
% Roll No:04 Mech
% Euler Method
f = input('\n Input function (dy/dx) = '); % Input the function directly
x0 = input('\n Enter the initial value of x (x0) = ');
y0 = input('\n Enter the initial value of y (y0) = ');
h = input('\n Input step size (h) = ');
xg = input('\n Enter the final value of x (xg) = ');

n = (xg - x0) / h; % Number of steps

for i = 1:n
    yg = y0 + h * f(x0, y0); % Euler's method calculation
    x0 = x0 + h;          % Increment x value
    y0 = yg;              % Update y value
end
    fprintf('the final value of yg = %f', yg);
```

output :-

```
Input function (dy/dx) =
@(x,y) (x-y*y)
 Enter the initial value of x (x0) = 0
 Enter the initial value of y (y0) = 1
 Input step size (h) = 1
 Enter the final value of x (xg) = 4
 the final value of yg = 1.000000
```

Eulers Method



PRACTICAL NO :-	5
PRACTICAL NAME :-	RUNGE KUTTA 2 (RK2)
STUDENT NAME :-	SIMRAN. V. AKHADE
DIV & ROLL NO :-	B(mech) - 04

Runge - Kutta (RK-2) method

$\frac{dy}{dx} = x + y$

where $x_0 = 0$ $y_0 = 1$

Here $h = 0.1$

find y_g at $x_g = 0.2$

Solution: Data:

$y(0) = 1$ $x(0) = 0$

$h = 0.1$

$\frac{dy}{dx} = f(x+y)$

Step 1: to calculate no. of iteration

$n = \frac{x_g - x_0}{h} = \frac{0.2 - 0}{0.1} = 2$

Iteration no: 1

$k = \frac{k_1 + k_2}{2}$

$k_1 = h \times f(x_0, y_0)$

$k_1 = 0.1 \times [0 + 1]$

$k_1 = 0.1$

where $x_1 = x_0 + h$

$x_1 = 0 + 0.1$

$x_1 = 0.1$

$k_2 = h \times f(x_0 + h, y_0 + k)$

$k_2 = 0.1 [0.1 + (1 + 0.1)]$

$k_2 = 0.12$

Here $k = \frac{k_1 + k_2}{2} = \frac{0.1 + 0.12}{2} = 0.11$

Here $y_g = y_0 + k$

$= 1 + 0.11$

$y_g = 1.11$

at $x = 0.1$ we get $y_g = 1.11$.

Iteration 2 : Replace x_0 by x_1 & y_0 by y_2

$k_1 = h \times f(x_1, y_1)$

$k_1 = 0.1 \times [0.1 + 1.11]$

$k_1 = 0.121$

Here $x_2 = x_1 + h$

$x_2 = 0.1 + 0.1$

$x_2 = 0.2$

$k_2 = h \times f(x_0 + h, y_0 + k)$

$k_2 = 0.1 [(0.1 + 0.1) + (1.11 + 0.121)]$

$k_2 = 0.1431$

$k = \frac{k_1 + k_2}{2} = \frac{0.121 + 0.1431}{2} = 0.1320$

$y_g = y_1 + k$

$= 1.11 + 0.1320$

$y_g = 1.242$

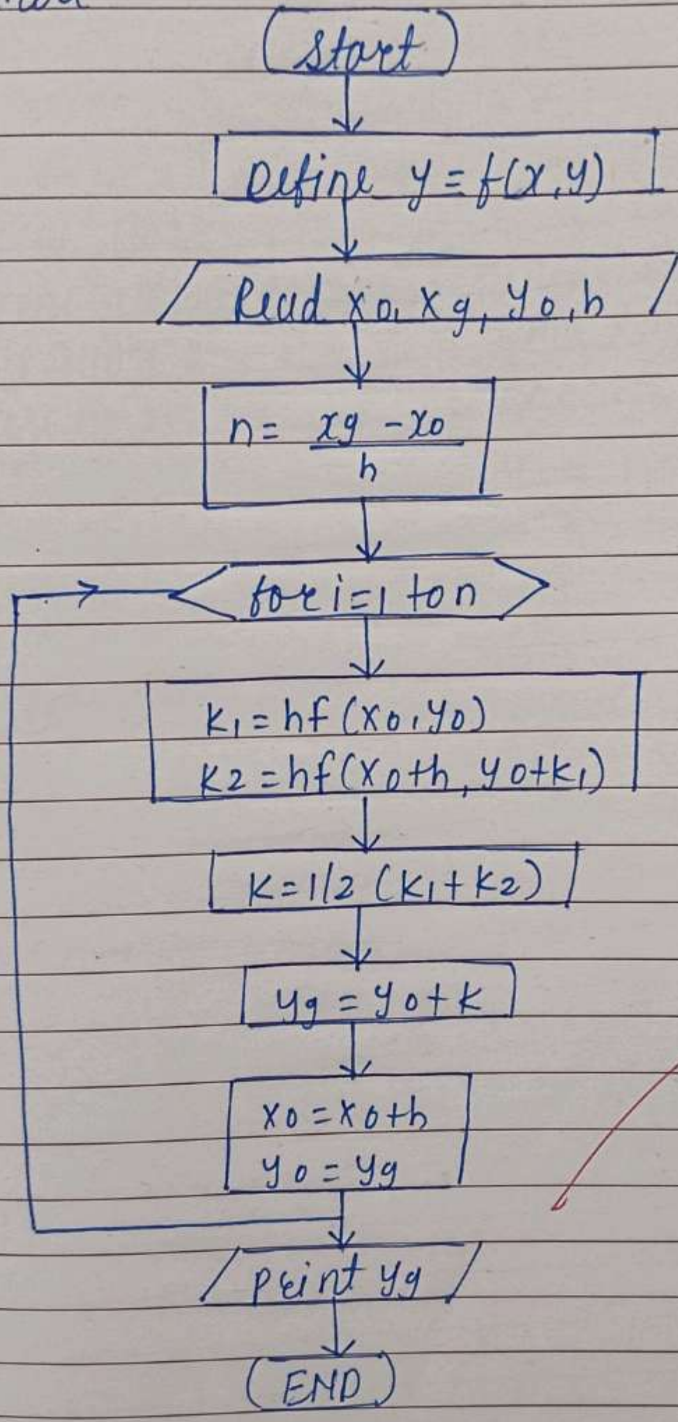
at $x_2 = 0.2$ we get $y_g = 1.242$

```
f = input('Enter the function y= f(x):');
xo=input('enter the initial value of xo:');
yo=input('enter the initial value of yo:');
xg=input('enter the initial value of xg:');
h=input('enter the initial value of h:');
 n=(xg-xo)/h;
for i=1:n
   k1=h*f(xo,yo);
   k2=h*f(xo+h,yo+k1);
   k=(k1+k2)/2;
   yg=yo+k;
   xo=xo+h;
   yo=yg;
end
fprintf('the final value of yg = %f',yg);
```

Output

```
Enter the function y= f(x):
@(x,y) (x+y)
enter the initial value of xo:
0
enter the initial value of yo:
1
enter the initial value of xg:
0.2
enter the initial value of h:
0.1
the final value of yg = 1.242050
```

RK-2 Method


Start
Define y = f(x,y)
Read x0, xg, y0, h
n = (xg - x0)/h
for i=1 to n
k1 = hf(x0, y0)
k2 = hf(x0+h, y0+k1)
k = 1/2 (k1+k2)
yg = y0+k
x0 = x0+h
y0 = yg
print yg
END

PRACTICAL NO:-	6
PRACTICAL NAME:-	TRAPOIZODAL RULE
STUDENT NAME:-	SIMRAN. V. AKHADE
DIV & ROLL NO:-	B(mech)-04

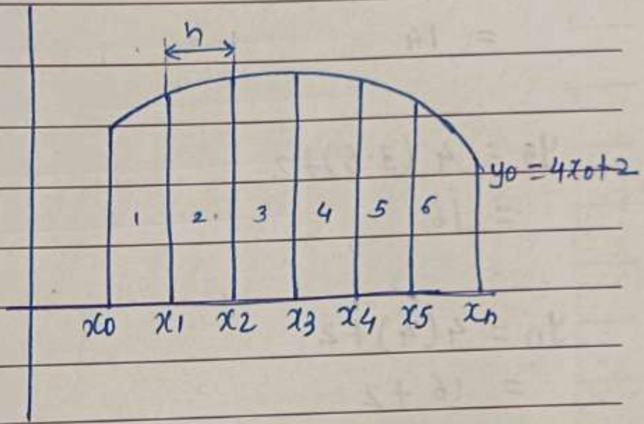
Trapezoidal Method

Evaluate (4x+2) within limits 1 to 4 by trapezoidal rule using 6 strips size.

Solution:- Data

$y = f(x) = 4x + 2$

$f(x) = \int_1^4 (4x+2)$



Now, $h = \frac{x_n - x_0}{n}$

$= \frac{4-1}{6}$

$\boxed{h = 0.5}$

Therefore, $x_0 = 1$

$x_1 = x_0 + h = [1 + 0.5] = 1.5$

$x_2 = x_1 + h = [1.5 + 0.5] = 2$

$x_3 = x_2 + h = [2 + 0.5] = 2.5$

$x_4 = x_3 + h = [2.5 + 0.5] = 3$

$x_5 = x_4 + h = [3 + 0.5] = 3.5$

Now, i) $y_0 = 4x_0 + 2$

$y_0 = 4(1) + 2$

$y_0 = 6$

ii) $y_1 = 4(1.5) + 2$

$= 8$

$y_3 = 4(2.5) + 2$

$= 12$

$y_4 = 4(3) + 2$

$= 14$

$y_5 = 4(3.5) + 2$

$= 16$

$y_n = 4(4) + 2$

$= 16 + 2$

$= 18$

Now, to find area

$$A = \frac{h}{2}\left[(y_0 + y_n) + 2(y_1 + y_2 + y_3 + y_4 + y_5)\right]$$

$$A = \frac{0.5}{2}\left[(6 + 18) + 2(8 + 10 + 12 + 14 + 16)\right]$$

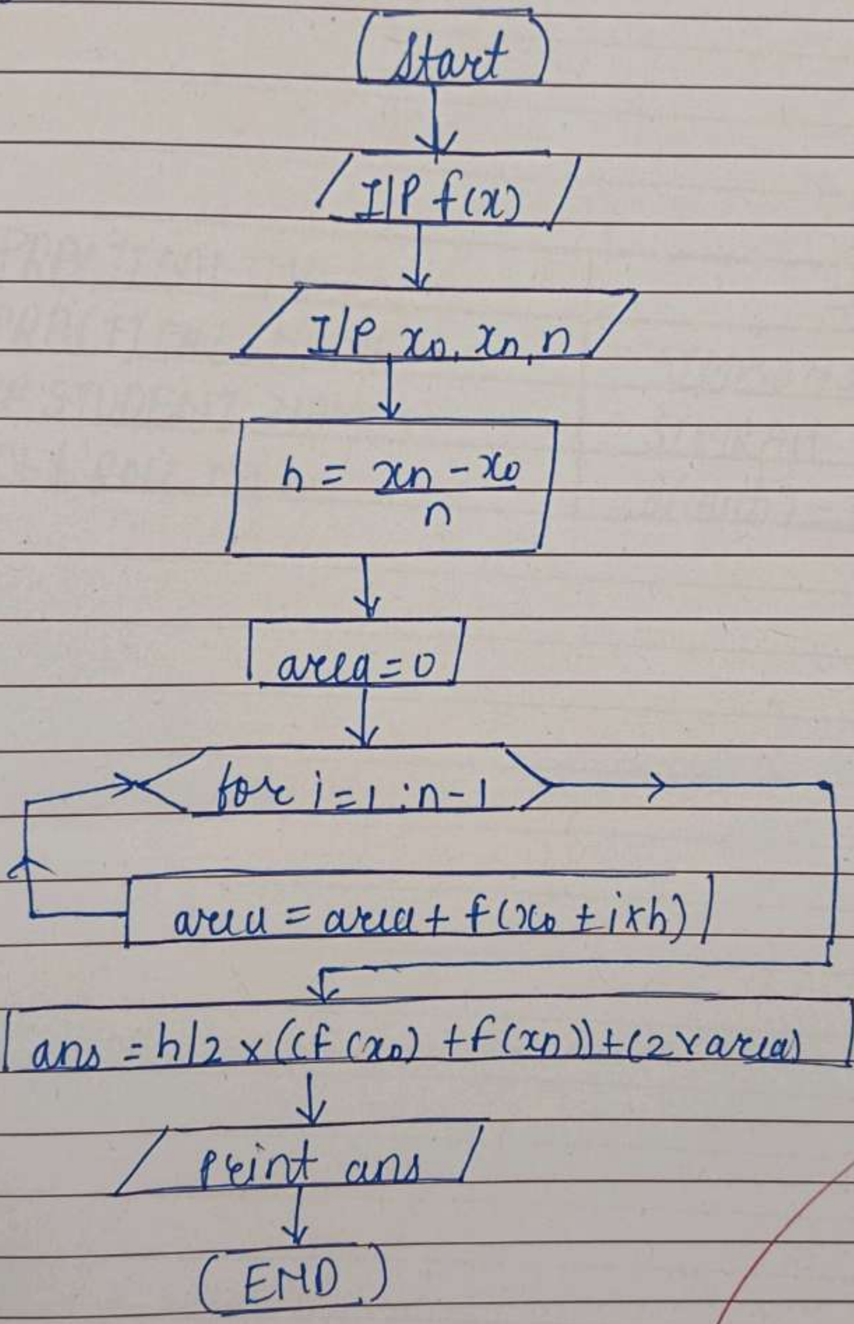
$$\boxed{A = 36}$$

Trapezodial

```
f = input('enter function y = f(x) = ');
xo = input('enter initial limit xo = ');
xn = input('enter final limit xn = ');
n = input('enter number of steps n = ');
h = (xn-xo)/n;
ans=0;
for i=1:n-1
    ans=ans+(f(xo+i*h));
end
ans=2*(ans);
ans1=f(xo)+f(xn);
area=ans+ans1;
area=area*(h/2);
fprintf('Total Area=%f',area);
```

```
Output
enter function y = f(x) =
@(x) (4*x+2)
enter initial limit xo =
1
enter final limit xn =
4
enter number of steps n =
6
Total Area=36.000000
```

Trapezoidal



PRACTICAL NO :-	7
PRACTICAL NAME :-	SIMPSON'S 1/3 RD RULE
~~PP~~ STUDENT NAME :-	SIMRAN. V. AKHADE
DIV. & ROLL NO :-	B(mech) - 04

ashik - 3

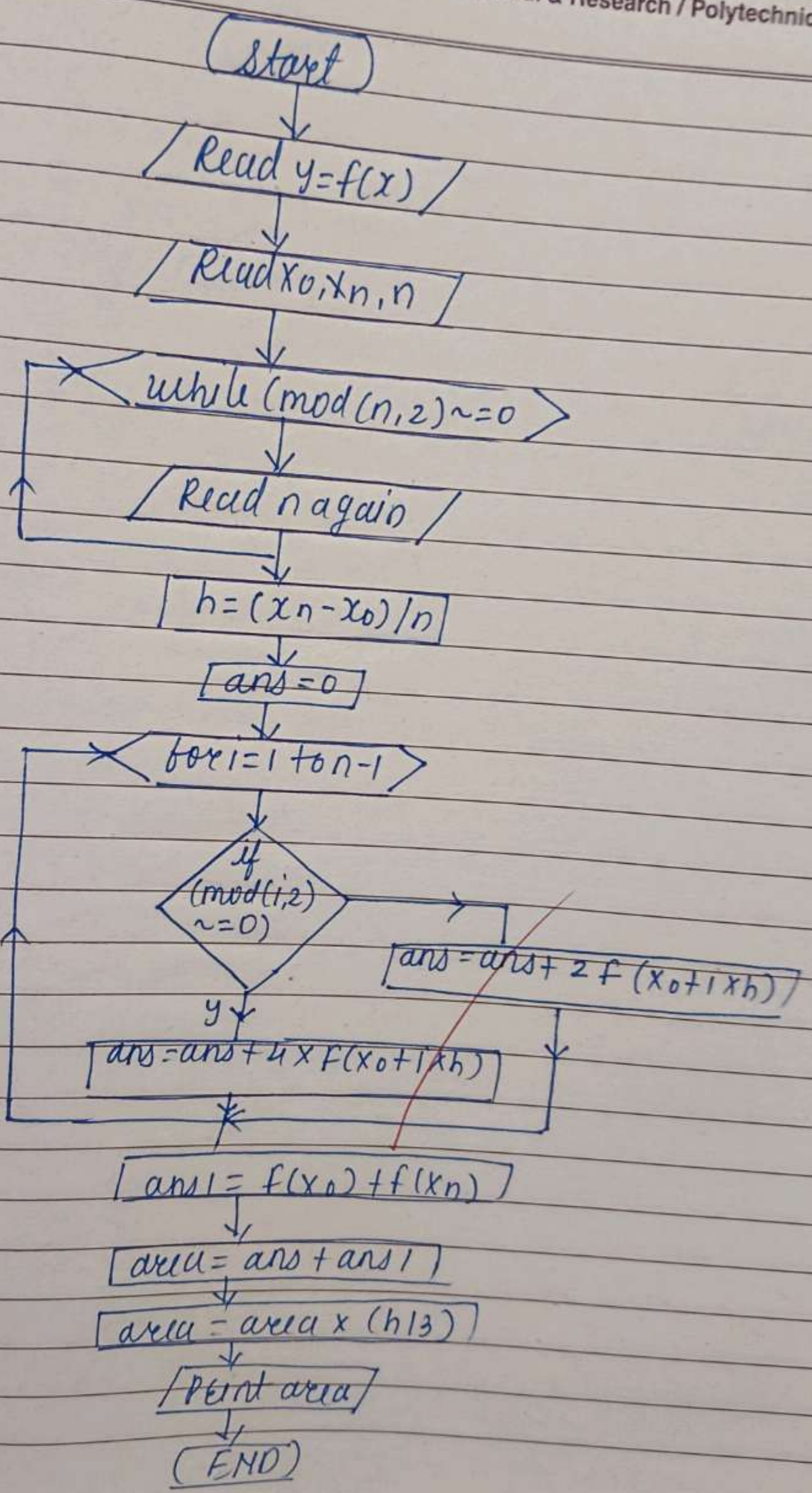
Simpsons1/3 rule

```
f = input('enter function y = f(x) = ');
xo = input('enter the value of xo: ');
xn = input('enter the value of xn: ');
n = input('enter the valueof n:');
h = (xn-xo)/n;
ans=0;

for i=1 : n-1
if(mod(i,2)~=0)
       ans=ans+4*(f(xo+i*h));
    else
  ans=ans+2*(f(xo+i*h));
    end
end
ans1=f(xo)+f(xn);
area=ans+ans1;
area=area*(h/3);
fprintf('\nTotal area = %f',area);
```

Output

```
simpson1
enter function y = f(x) =
@(x) exp(x)
enter the value of xo:
0
enter the value of xn:
4
enter the valueof n:
4

Total area = 53.863846
```

Simpson 1/3


Start
Read y=f(x)
Read x0,xn,n
while (mod(n,2)~=0
Read n again
h=(xn-x0)/n
ans=0
for i=1 to n-1
if (mod(i,2) ~=0)
ans=ans+2f(x0+i×h)
y
ans=ans+4×F(x0+i×h)
ans1= f(x0)+f(xn)
area= ans+ans1
area=area x (h/3)
Print area
END

PRACTICAL	8
PRACTICAL NAME	STRAIGHT LINE
STUDENT NAME	SIMRAN. V. AKHADE
DIV & ROLL NO	B(mech) - 04

q Straight line Eqn

x	1	2	3	4	5	6	7
y	0.5	2.5	2.0	4.0	3.5	6.0	5.5

Solution: genral Eqn of line is $y = ax + b$ as we need to fit a curve which is straight line it means to find values of A & B

to find out this two unknown constant we will apply list square technique as given below.

$y = ax + b$ — ①

we multiply by x on both side on eq ①

we get,

$xy = ax^2 + bx$ — ②

But in a given data set there will be 'n' values of x & y.

while finding a & b we must take submision of x summesion y value.

$y = a \times \Sigma x + n \times b$ — ③

$xy = a \times \Sigma x^2 + b \Sigma x$ — ④

m eq no. ③ & ④ we will prepare following table:

x	y	xy	x^2
1	0.5	0.5	1
2	2.5	5	4
3	2.0	6	9
4	4.0	16	16
5	3.5	17.5	25
6	6.0	36	36
7	5.5	38.5	49
28	24	119.5	140

Sustitute all submisionn value into eq no. 3 & 4 to findout constant a & b we apply creamers rule

we will rearrange the eq 3 & 4 we get

$a\Sigma x + nb = \Sigma y$

$a\Sigma x^2 + b\Sigma x = \Sigma xy$

Creamer's Rule

$a = \frac{\Delta a}{\Delta}$

$b = \frac{\Delta b}{\Delta}$

from eq no. 5 & 6 we will Represent in terms of matrics

$$\begin{bmatrix} \Sigma x & n \\ \Sigma x^2 & \Sigma x \end{bmatrix} \begin{bmatrix} a \\ b \end{bmatrix} = \begin{bmatrix} \Sigma y \\ \Sigma xy \end{bmatrix} \longrightarrow 7$$

from eq no. 7

Here $\Delta = \begin{vmatrix} \Sigma x & n \\ \Sigma x^2 & \Sigma x \end{vmatrix} = \begin{vmatrix} 28 & 7 \\ 140 & 28 \end{vmatrix}$

$= (28 \times 28) - (7 \times 140)$

$\Delta = -196$

rule to prepare Δa we replace column of a i.e 1st column

$\therefore \begin{bmatrix} \Sigma y & n \\ \Sigma xy & \Sigma x \end{bmatrix} = \begin{vmatrix} 24 & 7 \\ 119.5 & 28 \end{vmatrix}$

$= (24 \times 28) - (7 \times 119.5)$

$\Delta a = -164.5$

$\Delta b = \begin{bmatrix} \Sigma x & \Sigma y \\ \Sigma x^2 & \Sigma xy \end{bmatrix} = \begin{vmatrix} 28 & 24 \\ 140 & 119.5 \end{vmatrix}$

$\Delta b = -14$

now calculate

$a = \dfrac{\Delta a}{\Delta} = \dfrac{-164.5}{-196} = 0.839$

$$b = \frac{\Delta b}{\Delta} = \frac{-14}{-196} = 0.071$$

Now put value of a & b in eq ①

$$y = ax + b$$

$$y = 0.839\,(x) + 0.071$$

```
n=input('\nEnter The value of given points n:');
for i=1:n
   ar2(i)=input('\nEnter the value of x:');
   ar1(i)=input('\nEnter the value of y:');
end
sum0=0;
sum1=0;
sum2=0;
sum3=0;
for i=1:n
   sum0=sum0+ar2(i);
   sum1=sum1+ar1(i);
   sum2=sum2+ar2(i)*ar1(i);
   sum3=sum3+ar2(i)*ar2(i);
end
ds=sum0*sum0-n*sum3;
da=sum1*sum0-n*sum2;
db=sum0*sum2-sum1*sum3;
a=da/ds;
b=db/ds;
fprintf('a=%f',a);
fprintf('b=%f',b);
fprintf('y=%fx+%f',a,b);
```

OUTPUT

```
Enter The value of given points n:7
Enter the value of x:1
Enter the value of y:0.5
Enter the value of x:2
```

Enter the value of y:2.5

Enter the value of x:3

Enter the value of y:2

Enter the value of x:4

Enter the value of y:4

Enter the value of x:5

Enter the value of y:3.5

Enter the value of x:6

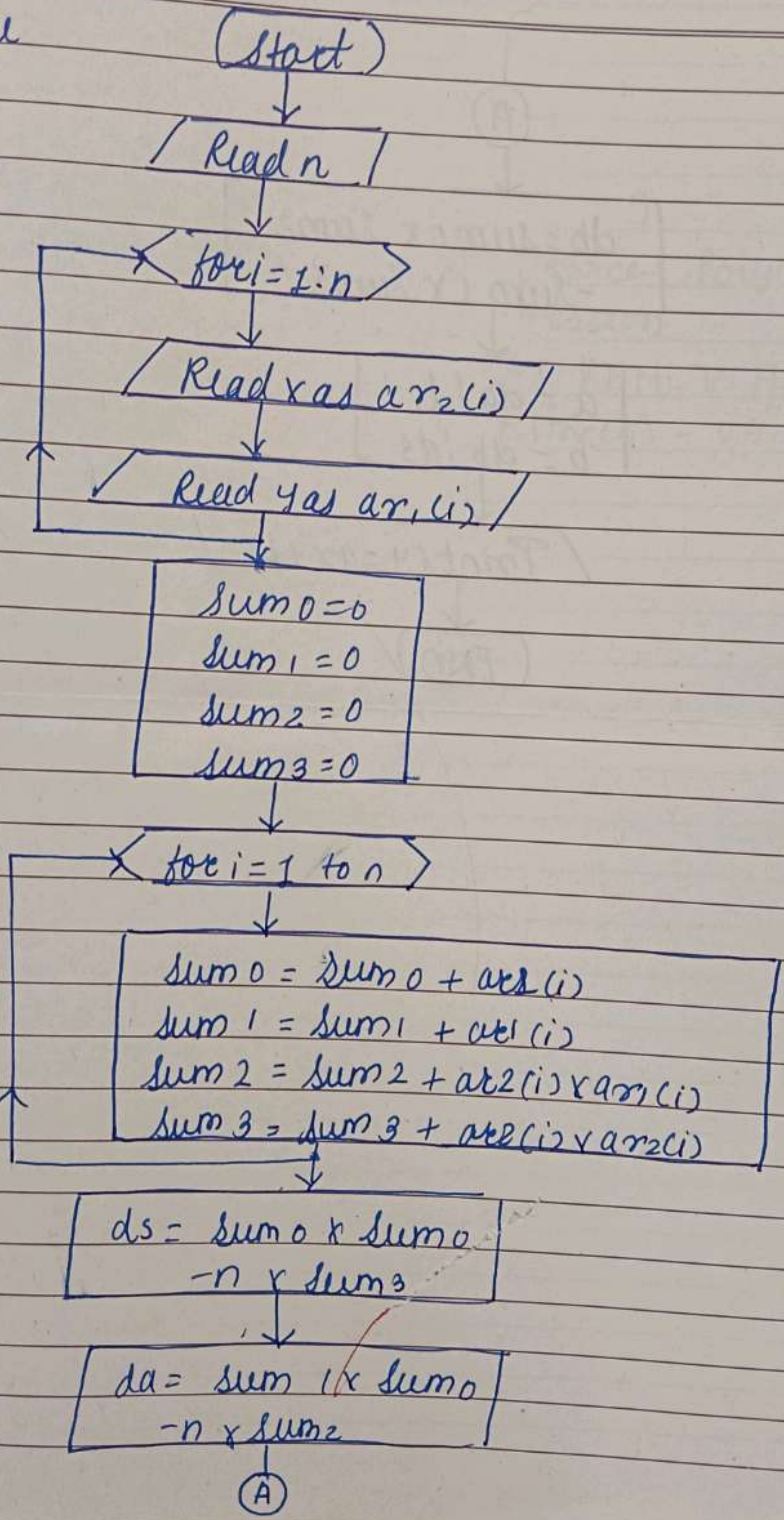
Enter the value of y:6

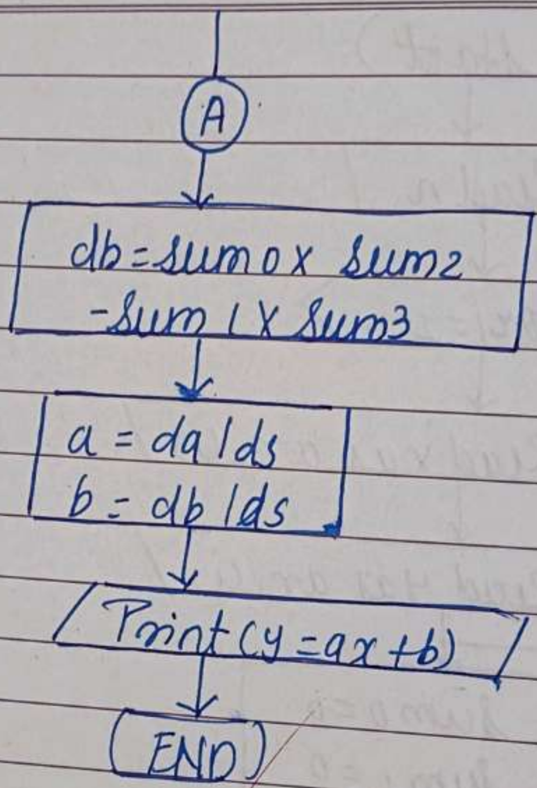
Enter the value of x:7

a=0.839286

b=0.071429y=0.839286x+0.071429

Straight line Regression




A
db=sum0 x sum2
-sum1 x sum3
a = da/ds
b = db/ds
Print(y=ax+b)
END

PRACTICAL NO : 9

PRACTICAL NAME : 2nd Degree Polynomial regression

STUDENT NAME : SIMRAN. V. AKHADE

DIV & Roll No : B(mech) - 04

2nd degree Polynomial Regression

Q following is data given for value of x & y fit a second degree polynomial of type ax^2+bx+c where a, b & c are constant.

x	-3	-2	-1	0	1	2	3
y	12	4	1	2	7	15	30

→ General eqn for 2nd degree polynomial is

$y = ax^2 + bx + c$ —— ①

we will multiply by 'x' on both sides.

$xy = ax^3 + bx^2 + cx$ — ②

Unknowns are three

Two get third eqn we will multiply by x again

$x^2y = ax^4 + bx^3 + cx^2$ —— ③

As their are 'n' no. of data points for x & y we will take
Σ - on both side 'x' & 'y'

∴ Rewrite the eqn no ① ② ③

$\Sigma y = a\Sigma x^2 + b\Sigma x + n*b$ — ④

$\Sigma xy = a\Sigma x^3 + b\Sigma x^2 + c\Sigma x$ — ⑤

$\Sigma x^2y = a\Sigma x^4 + b\Sigma x^3 + c\Sigma x$ — ⑥

x	y	xy	x^2	x^3	x^4	x^2y
-3	12	-36	9	-27	81	108
-2	4	-8	4	-8	16	16
-1	1	-1	1	-1	1	1
0	2	0	0	0	0	0
1	7	7	1	1	1	7
2	15	30	4	8	16	60
3	30	90	9	27	81	270
0	71	82	28	~~196~~ 0	196	462

$$\begin{bmatrix} \Sigma x^2 & \Sigma x & n \\ \Sigma x^3 & \Sigma x^2 & \Sigma x \\ \Sigma x^4 & \Sigma x^3 & \Sigma x^2 \end{bmatrix} \begin{bmatrix} a \\ b \\ c \end{bmatrix} = \begin{bmatrix} \Sigma y \\ \Sigma xy \\ \Sigma x^2y \end{bmatrix}$$

above matrix will be solve the Grammer's rule

$$\Delta = \begin{vmatrix} 28 & 0 & 7 \\ 0 & 28 & 0 \\ 196 & 0 & 28 \end{vmatrix}$$

$= 28(28 \times 28 - 0 \times 0) - 0(0 \times 28 - 0 \times 196) + 7(0 \times 0 - 28 \times 196)$

$\Delta = -16464$

$$\Delta a = \begin{vmatrix} 71 & 0 & 7 \\ 82 & 28 & 0 \\ 462 & 0 & 28 \end{vmatrix}$$

$= 71(28 \times 28 - 0 \times 0) - 0(82 \times 28 - 0 \times 462)$
$+ 7(82 \times 0 - 28 \times 462)$
$= -34888.$

$$\Delta b = \begin{vmatrix} 28 & 71 & 7 \\ 0 & 82 & 0 \\ 196 & 462 & 28 \end{vmatrix}$$

$= 28(82 \times 28 - 0 \times 462) - 71(0 \times 28 - 0 \times 196)$
$+ 7(0 \times 462 - 82 \times 196)$
$\Delta b = -48216$

$$\Delta c = \begin{vmatrix} 28 & 0 & 71 \\ 0 & 28 & 82 \\ 196 & 0 & 462 \end{vmatrix}$$

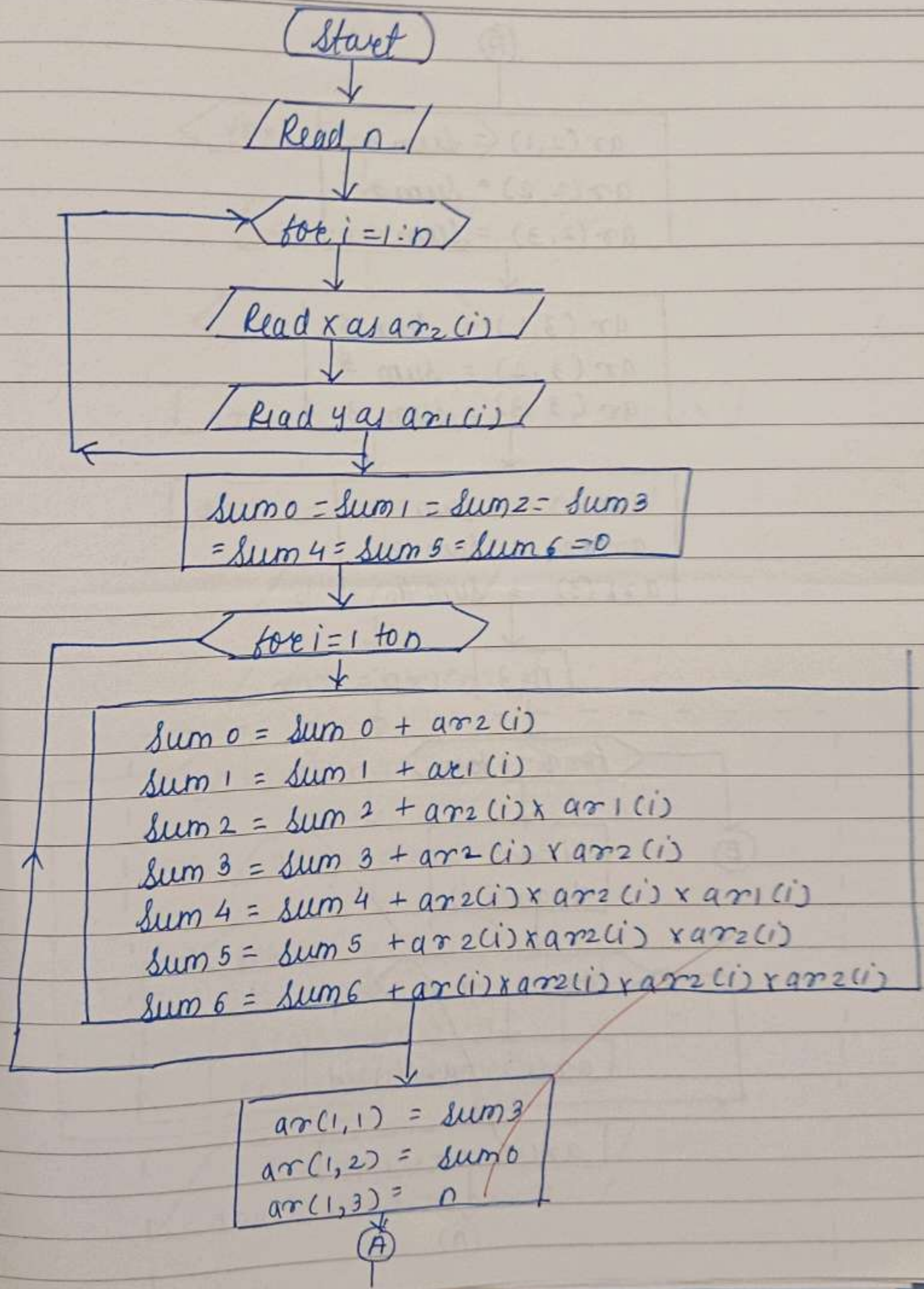
$= 28(28 \times 462 - 82 \times 0) - 0(0 \times 462 - 82 \times 196)$
$+ 71(0 \times 0 - 28 \times 196)$
$= -27440$

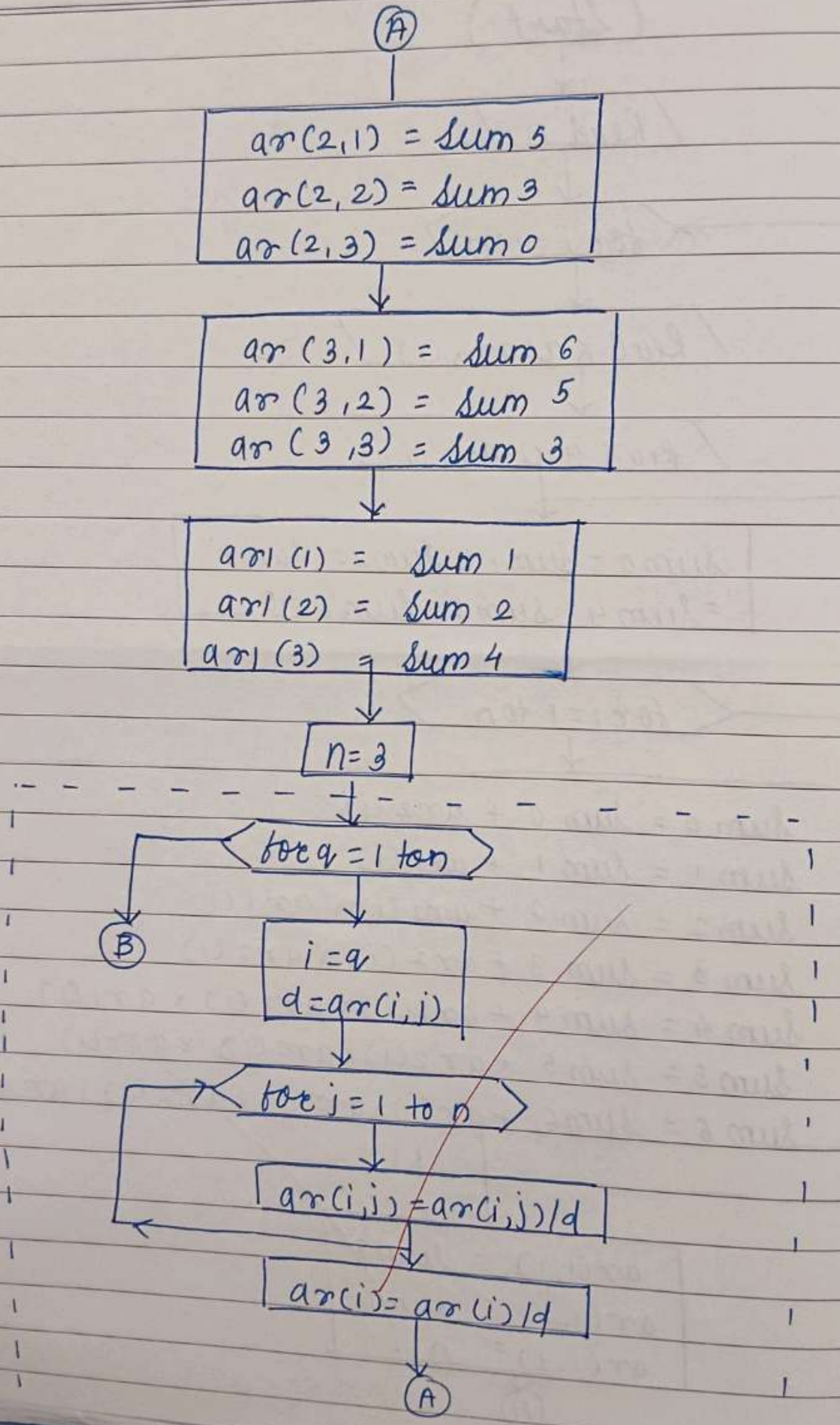
$\therefore a = \frac{\Delta a}{\Delta} = 2.11904$

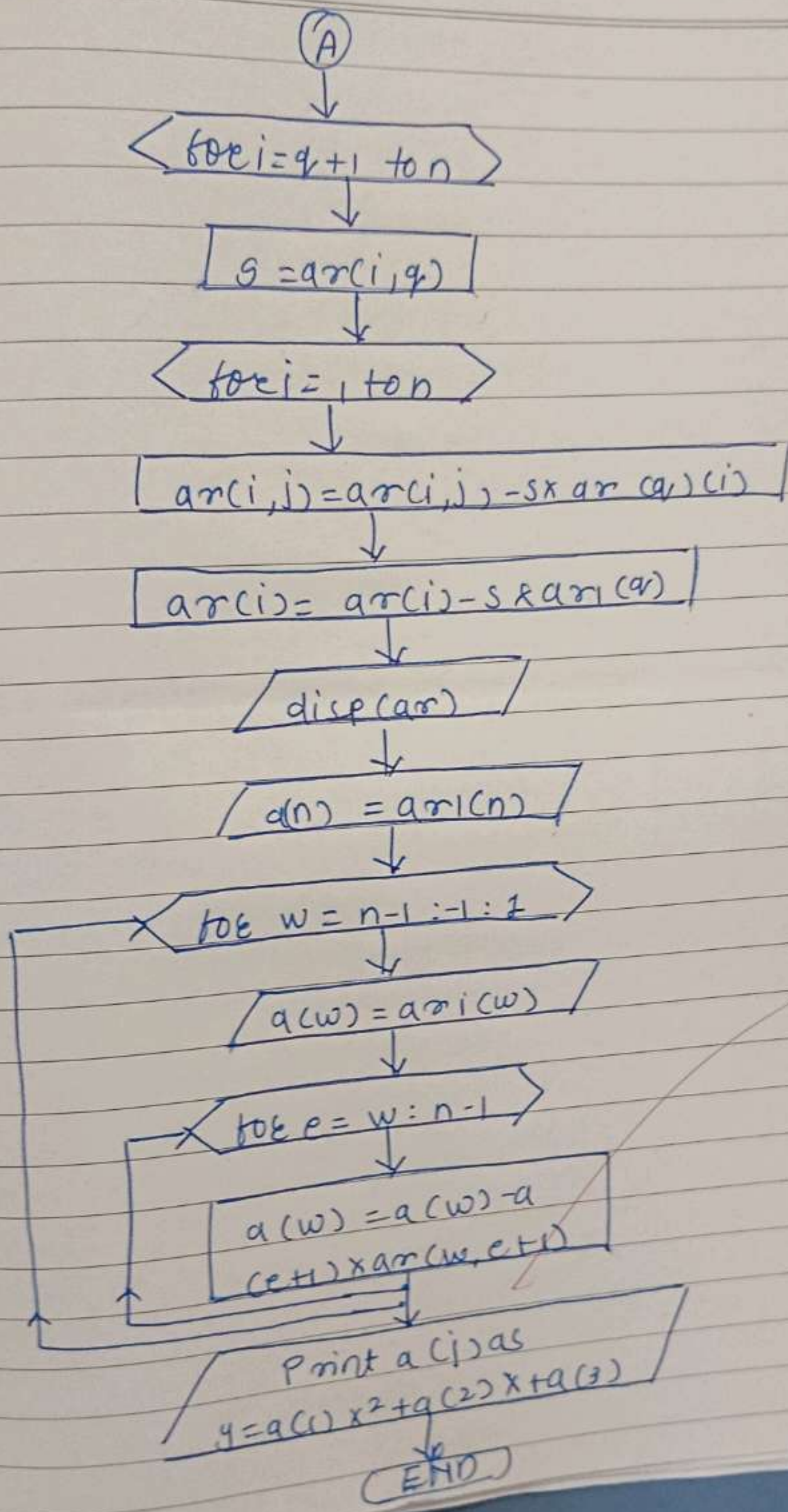
$b = \frac{\Delta b}{\Delta} = 2.9285$

$c = \frac{\Delta c}{\Delta} = 1.6667$

$\therefore$ The value of a, b & c is $a = 2.11904$,
$b = 2.9285$
$c = 1.6667$


Start
Read n
for i = 1 : n
Read x as ar2 (i)
Read y as ar1 (i)
sum0 = sum1 = sum2 = sum3 = sum4 = sum5 = sum6 = 0
for i = 1 to n
sum 0 = sum 0 + ar2 (i)
sum 1 = sum 1 + ar1 (i)
sum 2 = sum 2 + ar2 (i) x ar1 (i)
sum 3 = sum 3 + ar2 (i) x ar2 (i)
sum 4 = sum 4 + ar2(i) x ar2 (i) x ar1 (i)
sum 5 = sum 5 + ar2(i) x ar2(i) x ar2(i)
sum 6 = sum6 + ar(i) x ar2(i) x ar2 (i) x ar2(i)
ar(1,1) = sum3
ar(1,2) = sum0
ar(1,3) = n
A


A
ar(2,1) = sum 5
ar(2,2) = sum 3
ar(2,3) = sum 0
ar(3,1) = sum 6
ar(3,2) = sum 5
ar(3,3) = sum 3
ar1(1) = sum 1
ar1(2) = sum 2
ar1(3) = sum 4
n=3
for q = 1 to n
B
i=q
d=ar(i,i)
for j = 1 to n
ar(i,j) = ar(i,j)/d
ar(i) = ar(i)/d
A


A
for i=q+1 to n
s =ar(i,q)
for i=1 to n
ar(i,j)=ar(i,j)-s×ar(q)(i)
ar(i)= ar(i)-s×ar(q)
disp(ar)
a(n) =ar(n)
for w = n-1 :-1 : 1
a(w) = ar(w)
for e = w : n-1
a(w) =a(w)-a
(e+1)×ar(w,e+1)
Print a(i) as
y=a(1) x^2 +a(2) x+a(3)
END

nic Nashik - 3

Simran Akhade

Roll.no :4

```
n=input('\nEnter the value of given points n');
for i=1:n
ar2(i)=input('\nEnter the value of x:');
ar1(i)=input('\nEnter the value of y
:'); end
sum0=0;
sum1=0;
sum2=0;
sum3=0;
sum4=0;
sum5=0;
sum6=0;
for i=1:n
sum0=sum0+ar2(i);
sum1=sum1+ar1(i);
sum2=sum2+ar2(i)*ar1(i);
sum3=sum3+ar2(i)*ar2(i);
sum4=sum4+ar2(i)*ar2(i)*ar1(i);
sum5=sum5+ar2(i)*ar2(i)*ar2(i);
sum6=sum6+ar2(i)*ar2(i)*ar2(i)*ar2(i);
end
ar(1,1)=sum3;
ar(1,2)=sum0;
ar(1,3)=n;
ar(2,1)=sum5;
ar(2,2)=sum3;
ar(2,3)=sum0;
ar(3,1)=sum6;
ar(3,2)=sum5;
```

```
ar(3,3)=sum3;
ar1(1)=sum1;
ar1(2)=sum2;
ar1(3)=sum4;
n=3;
for q=1:n
i=q;
d=ar(i,i);
for j=1:n
ar(i,j)=ar(i,j)/d;
end
ar1(i)=ar1(i)/d;
for i=q+1:n
s=ar(i,q);
for j=1:n
ar(i,j)=ar(i,j)-s*ar(q,j);
end
ar1(i)=ar1(i)-s*ar1(q);
end
end
disp(ar);
a(n)=ar1(n);
for w=n-1:-1:1
    a(w)=ar1(w);
    for e=w:n-1
    a(w)=a(w)-(a(e+1)*ar(w,e+1));
end
end
fprintf('\n\n y=%fx*x+%f*x+%f',a(1),a(2),a(3));
```

OUTPUT

Enter the value of given points n

7

Enter the value of x:

-3

Enter the value of y :

12

Enter the value of x:

-2

Enter the value of y :

4

Enter the value of x:

-1

Enter the value of y :

1

Enter the value of
x:

0

Enter the value of y :

2

Enter the value of
x:

1

Enter the value of y :

7

Enter the value of
x:

2

Enter the value of y :

15

Enter the value of
x:

3

Enter the value of y :

30

1.0000   0   0.2500

0	1.0000	0
0	0	1.0000

y=2.119048x*x+2.928571*x+1.666667

PRACTICAL NO : 10

PRACTICAL NAME : LAGRANGE'S ~~of STATAT~~iC

STUDENT NAME : SIMRAN. V. AKHADE.

DIV & ROLL NO : B(mech) -04

Q find interpolating polynomial for following data

x	0	1	2	5
$y = f(x)$	2	3	12	147

find value of y at x = 1.5 by using lagrange's Interpolation

$x_0 = 0 \quad y_0 = 2 \quad x_g = 1.5$

$x_1 = 1 \quad y_1 = 3 \quad y_g = ?$

$x_2 = 2 \quad y_2 = 12$

$x_3 = 5 \quad y_3 = 147$

$$\therefore y_g = y_0 L_0 + y_1 L_1 + y_2 L_2 + y_3 L_3$$

$$\therefore L_0 = \frac{(x_g - x_1)(x_g - x_2)(x_g - x_3)}{(x_0 - x_1)(x_0 - x_2)(x_0 - x_3)}$$

$$\therefore L_0 = \frac{(1.5-1)(1.5-2)(1.5-5)}{(0-1)(0-2)(0-5)}$$

$$L_0 = -0.0875$$

$$L_1 = \frac{(x_g - x_0)(x_g - x_2)(x_g - x_3)}{(x_1 - x_0)(x_1 - x_2)(x_1 - x_3)}$$

$$L_1 = 0.6562$$

$$L_2 = \frac{(x_g - x_0)\,(x_g - x_1)\,(x_g - x_3)}{(x_2 - x_0)\,(x_2 - x_1)\,(x_2 - x_3)}$$

$L_2 = 0.4375$

$$L_3 = \frac{(x_g - x_0)\,(x_g - x_1)\,(x_g - x_2)}{(x_3 - x_0)\,(x_3 - x_1)\,(x_3 - x_2)}$$

$L_3 = -0.00625$

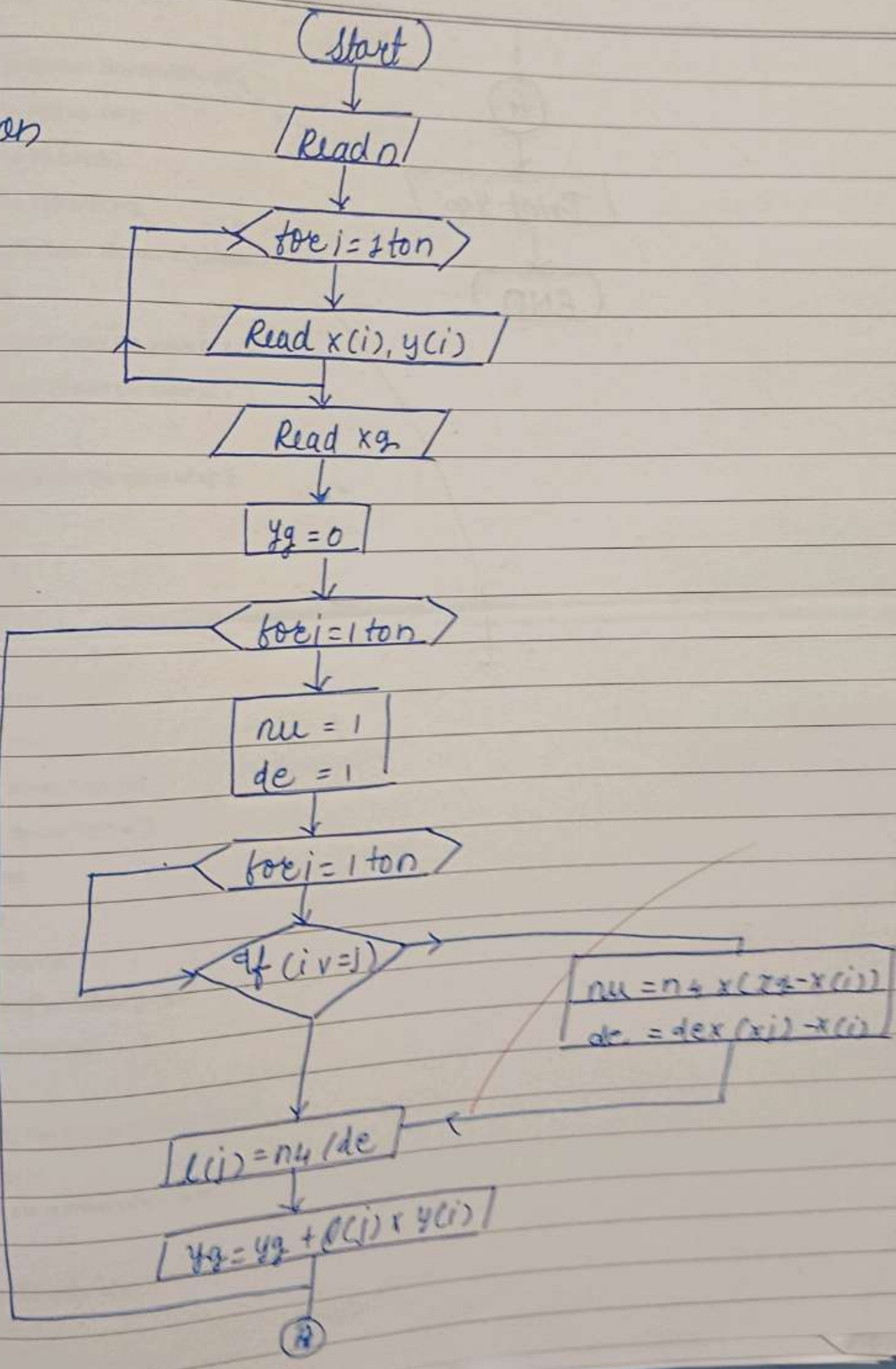
$y_g = y_0 L_0 + y_1 L_1 + y_2 L_2 + y_3 L_3$

$y_g = 2 \times (-0.6875) + 3 \times (0.6562) + 12 \times 0.4375 + 147 \times (-0.0062$

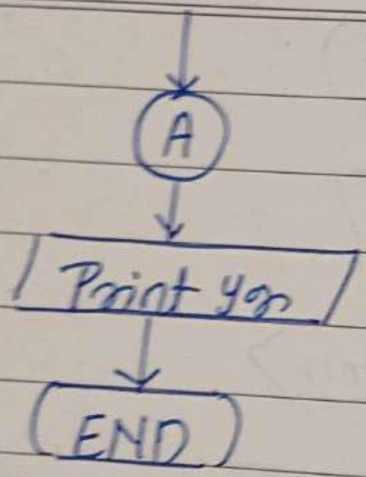
$y_g = 6.125$

The final value of $y_g = 6.125$

lowchart:
agrangis
terpolation



7X (-0.00


A
Print yes
END

Nashik - 3

Lagranges method

INPUT

```
fprintf('\n Name : Simran Akhade');
fprintf('\n Roll no. 04');
fprintf('\n B1 batch');
fprintf('\n TYB MECH');
n=input('\n Enter the no. of elements n:');
for i=1:n
  x(i)=input('Enter the value of x :');
  y(i)=input('Enter the value of y :');
end
xg=input('Enter the value of xg:');
yg=0;
for j=1:n
  nu=1;
  de=1;
  for i=1:n
    if (i~=j)
      nu=nu*(xg-x(i));
      de=de*(x(j)-x(i));
    end
  end
  l(j)=nu/de;
  fprintf('\n L%f=%f',j,l(j));
  yg=yg+l(j)*y(j);
end
fprintf('The final value of yg %f, yg');
```

OUTPUT

Enter the number of elements n :

4

Enter the value of x :

0

Enter the value of y :

2

Enter the value of x :

1

Enter the value of y :

3

Enter the value of x :

2

Enter the value of y :

12

Enter the value of x :

5

Enter the value of y :

147

Enter the value of xg :

1.5

L1.000000=-0.087500

L2.000000=0.656250

L3.000000=0.437500

L4.000000=-0.006250The final value of yg 6.125000

PRACTICAL NO : 11
PRACTICAL NAME : MEAN, MEDIAN, MODE
STUDENT NAME : SIMRAN. AKHADE
DIV ROll NO : B(mech) -04

x	f	x	$x \cdot f$	cf	x^2	$f \cdot x^2$	f^2
0-10	13	5	65	13	25	325	169
10-20	20	15	300	33	225	4500	400
20-30	30	25	750	63	625	18750	900
30-40	25	35	875	88	1225	30625	625
40-50	12	45	540	100	2025	24300	144
	100	125	2530		4125	78500	2238

1) Arithematic mean:

$$\bar{x} = \frac{\Sigma f x}{\Sigma f} = \frac{2530}{100} = 25.3$$

2) Median

$$\frac{N}{2} = \frac{100}{2} = 50$$

median is 20-30 span

median = 25

3) Mode $l + \frac{h(f_1 - f_0)}{2f_1 - f_0 - f_0}$

$f_0 = 20$

$f_1 = 30$

$f_2 = 25$

$l = 20$

$h = 10$

$$= 20 + \frac{10(30-20)}{2 \times 30 - 20 - 25}$$

mode = 26.67

4) standerd deviation

$$\sigma = \sqrt{\frac{\Sigma f(x)^2}{N} - \left(\frac{\Sigma fx}{N}\right)^2}$$

$$= \sqrt{\frac{(78500)}{(100)} - \left(\frac{2530}{100}\right)^2}$$

$$= 12.037$$

5) karl pearson coeff. of skewness

$$Sk = \frac{\text{mean} - \text{mode}}{\sigma}$$

$$= \frac{25.3 - 26.67}{12.037}$$

$$= -0.1138.$$

6) karl pearson's correlation coeff..

$\Sigma X = 125$

$\Sigma Y = 100$

$\Sigma XY = 2530$

$\Sigma X^2 = 1425$

$\Sigma Y^2 = 2238$

$$r = \left[\frac{(5(2530) - (125)(100)}{\sqrt{5(4125) - (125)^2}\sqrt{5(2238 - (100)^2}}\right]$$

$r = 0.06144$

(start)

↓

Input no. of data point (n)

↓

Initiating arrays x & frequency with sign n

↓

Rearrange x & f

Calculate weight sum of $x = \text{sum}(x \times f)$

Calculate sum of f frequency

$$\text{mean} = \frac{\text{sum}(x \times F)}{\text{sum } f}$$

```
n = input('Enter the Value of n: ');
l = input('\nEnter the value of l (lower limit of modal class): ');
h = input('\nEnter the value of h (class width): ');

for i = 1:n
    x(i) = input('\nEnter the value of x: ');
    f(i) = input('\nEnter the value of f: ');
end

sumx = 0;
sumf = 0;
sumfx = 0;

for i = 1:n
    sumf = sumf + f(i);
    sumx = sumx + x(i);
    sumfx = sumfx + x(i) * f(i);
end

mean_value = sumfx / sumf;
fprintf('Arithmetic Mean: %f\n', mean_value);

values = repelem(x, f);
std_dev = std(values);
fprintf('Standard Deviation: %f\n', std_dev);

% Mode calculation
[fm, mode_idx] = max(f);
```

```
if mode_idx > 1 && mode_idx < n
    f1 = f(mode_idx - 1);
    f2 = f(mode_idx + 1);
    mode_val = l + h * ((fm - f1) / (2 * fm - f1 - f2));
    fprintf('Mode: %f\n', mode_val);
else
    fprintf('Mode calculation is not possible due to insufficient class intervals.\n');
end

% Skewness calculation

skew_val = (mean_value - mode_val) / (std_dev) ;
fprintf('Skewness: %f\n', skew_val);
```

Output

```
Enter the Value of n: 5

Enter the value of l (lower limit of modal class): 20

Enter the value of h (class width): 10

Enter the value of x: 5

Enter the value of f: 13

Enter the value of x: 15

Enter the value of f: 20

Enter the value of x: 25
```

t class intervals.\n');

Enter the value of f: 30

Enter the value of x: 35

Enter the value of f: 25

Enter the value of x: 45

Enter the value of f: 12

Arithmetic Mean: 25.300000

Standard Deviation: 12.098501

Mode: 26.666667

Skewness: -0.112962

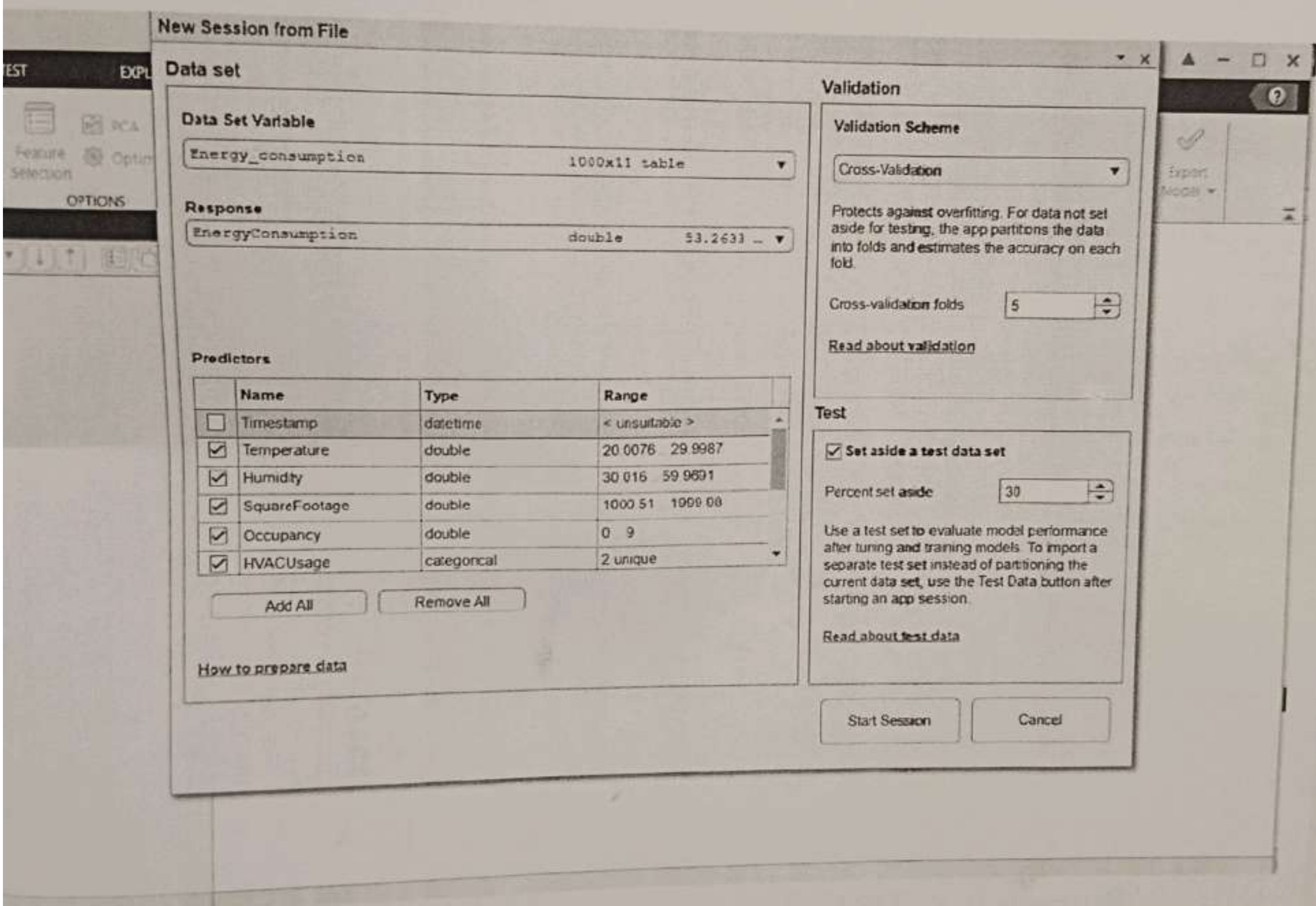
SR

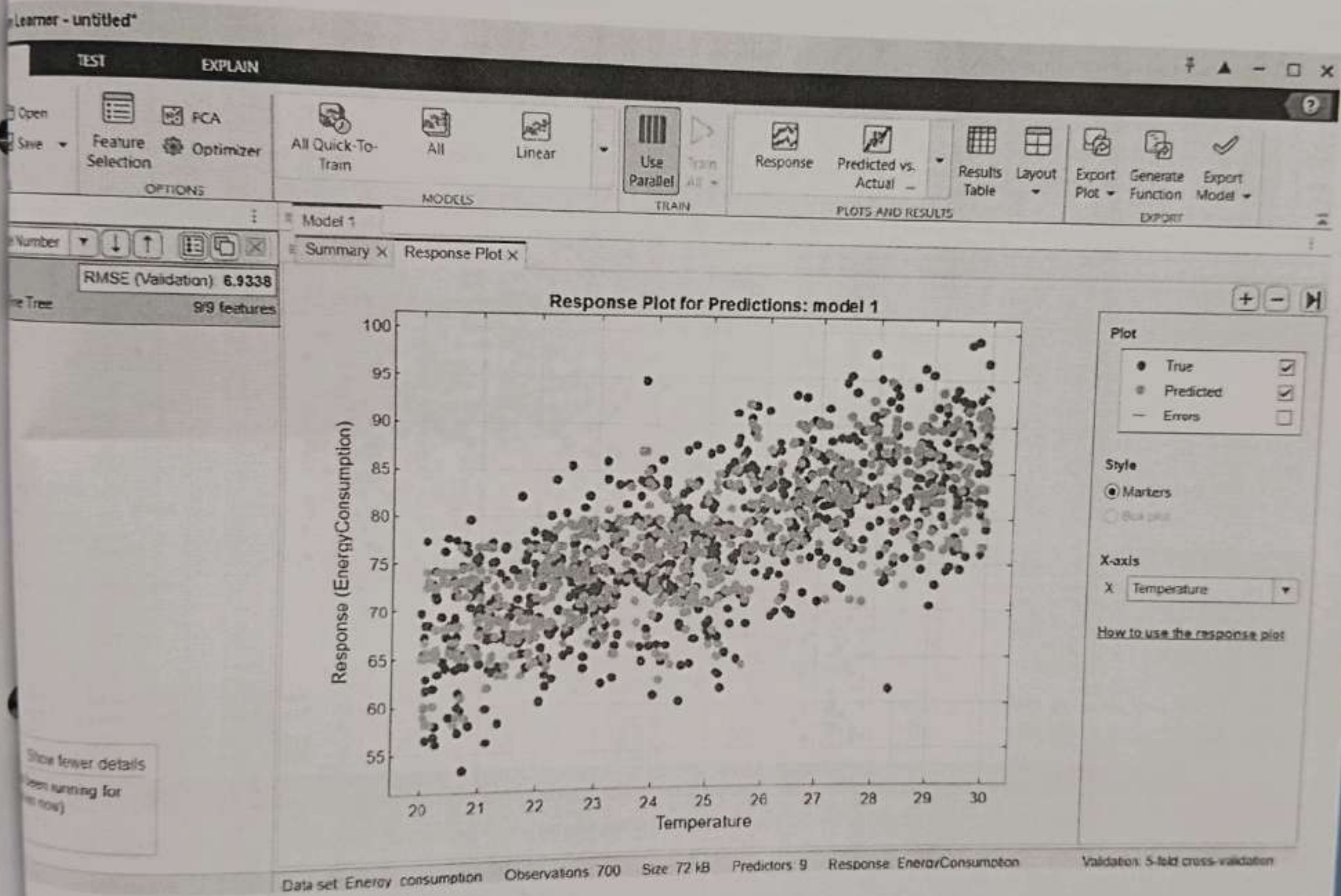
PRACTICAL NO : 12

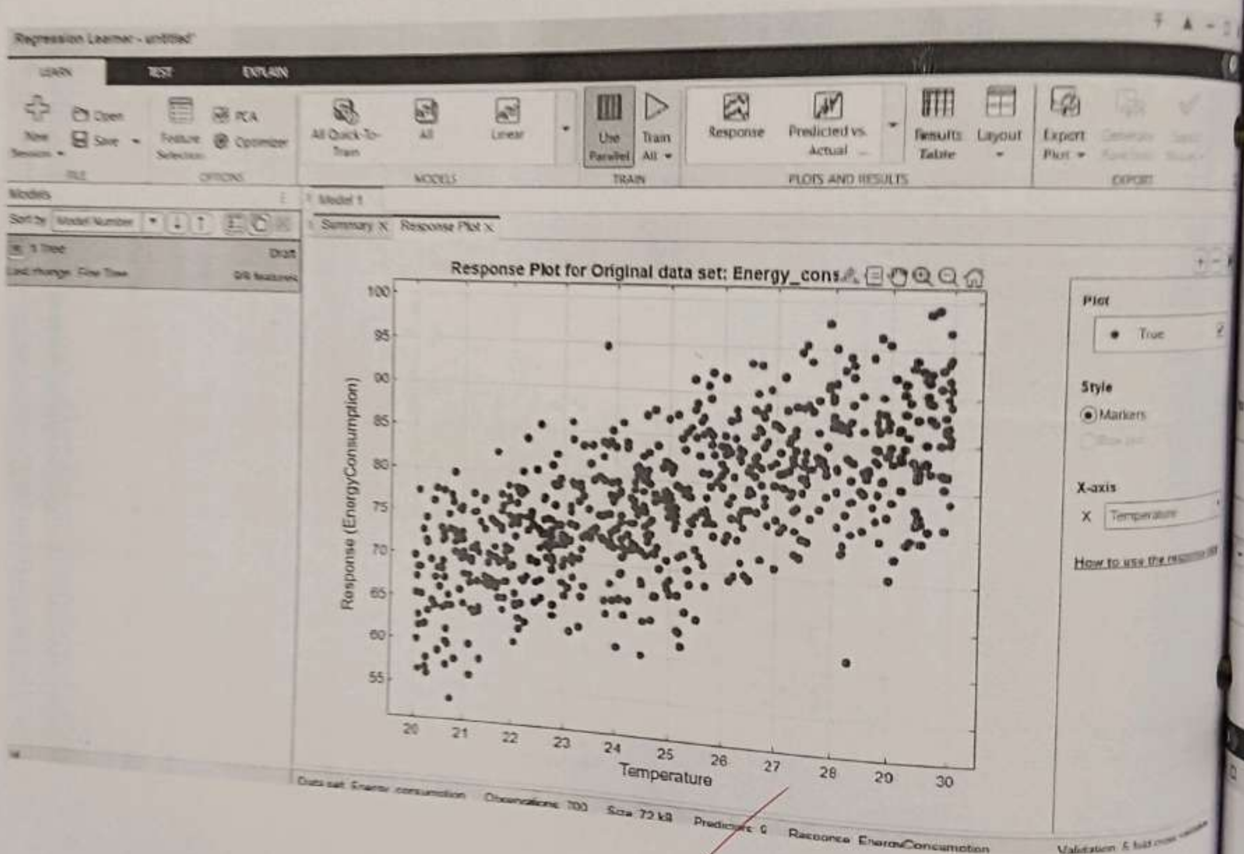
PRACTICAL NAME: DATA SETS

STUDENT NAME : SIMRAN AKHADE

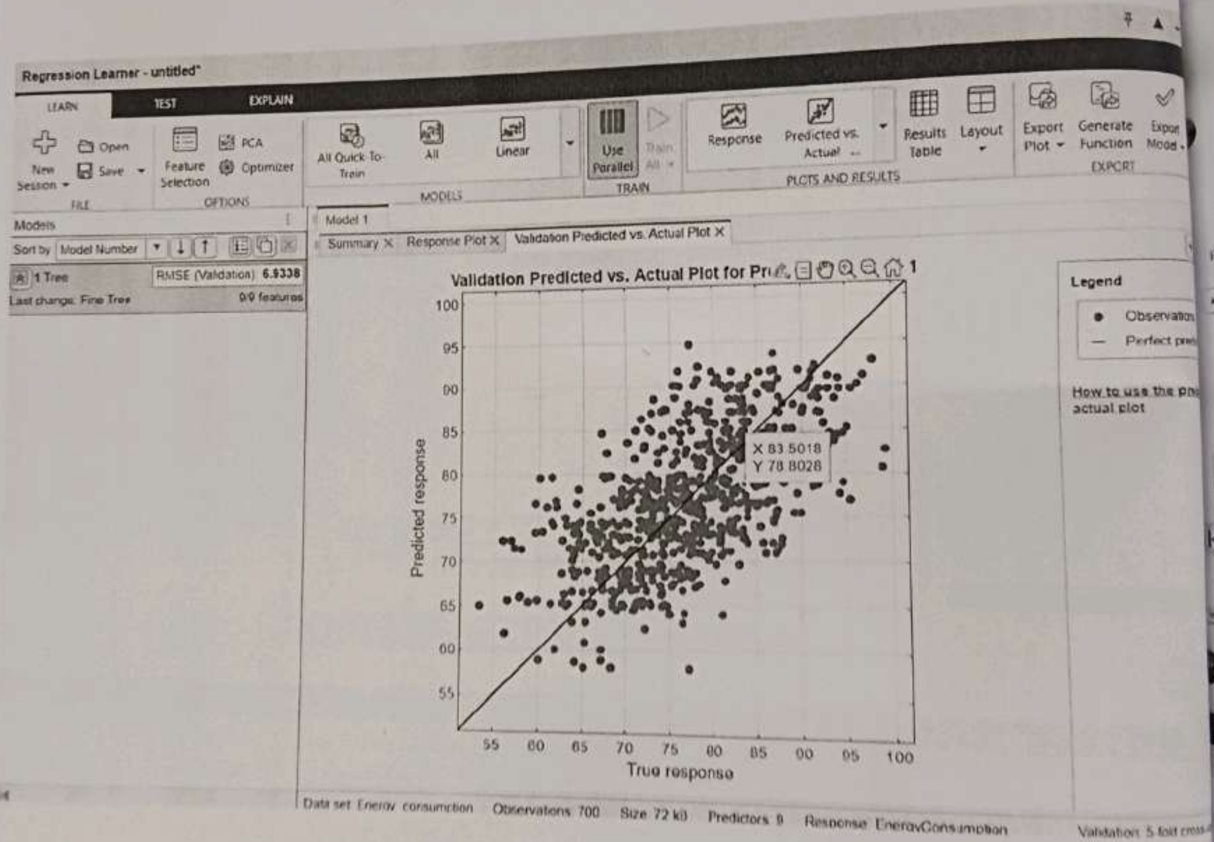
Roll NO/DIV : B(mech) -04

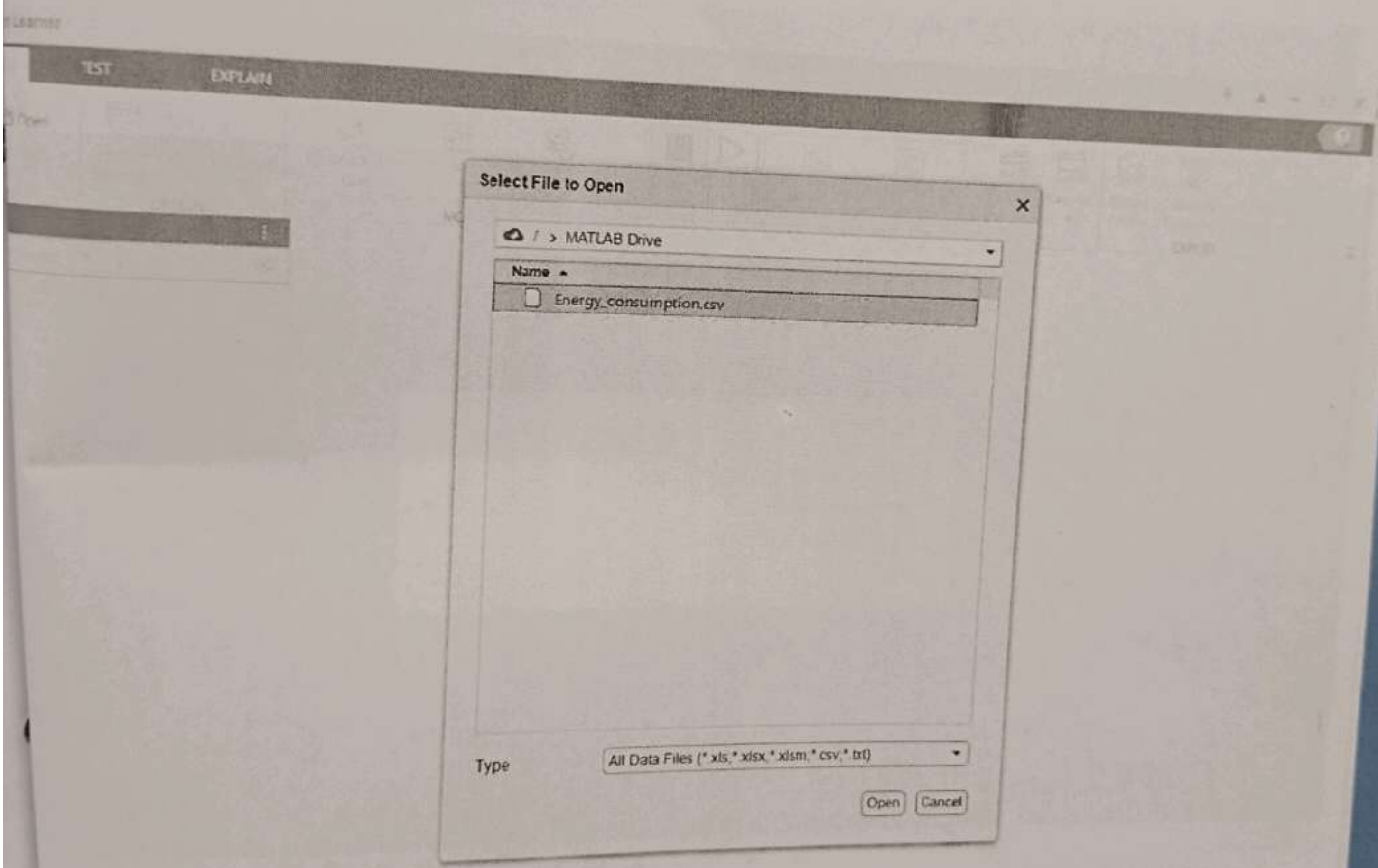

New Session from File
Data set
Data Set Variable
Energy_consumption 1000x11 table
Response
EnergyConsumption double 53.2633 ...
Predictors
Name
Type
Range
Timestamp datetime < unsuitable >
Temperature double 20.0076 29.9987
Humidity double 30.016 59.9691
SquareFootage double 1000.51 1999.08
Occupancy double 0 9
HVACUsage categorical 2 unique
Add All
Remove All
How to prepare data
Validation
Validation Scheme
Cross-Validation
Protects against overfitting. For data not set aside for testing, the app partitions the data into folds and estimates the accuracy on each fold.
Cross-validation folds 5
Read about validation
Test
Set aside a test data set
Percent set aside 30
Use a test set to evaluate model performance after tuning and training models. To import a separate test set instead of partitioning the current data set, use the Test Data button after starting an app session.
Read about test data
Start Session
Cancel
OPTIONS
Feature Selection
PCA

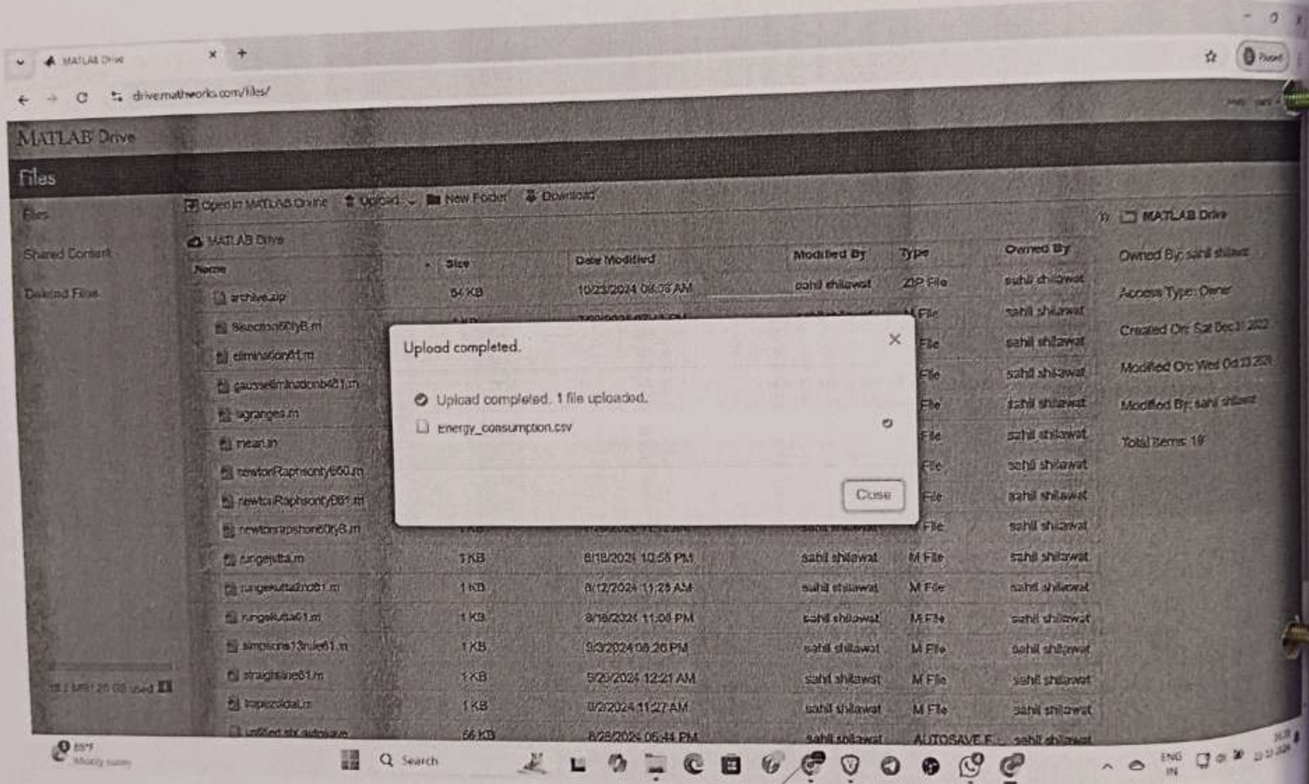

Learner - untitled*
TEST
EXPLAIN
Open
Save
Feature Selection
PCA
Optimizer
OPTIONS
All Quick-To-Train
All
Linear
MODELS
Use Parallel
Train All
TRAIN
Response
Predicted vs. Actual
Results Table
Layout
PLOTS AND RESULTS
Export Plot
Generate Function
Export Model
EXPORT
Model 1
Summary
Response Plot
RMSE (Validation) 6.9338
9/9 features
Response Plot for Predictions: model 1
Response (EnergyConsumption)
Temperature
Plot
True
Predicted
Errors
Style
Markers
X-axis
Temperature
How to use the response plot
Show fewer details
Data set: Energy consumption
Observations: 700
Size: 72 kB
Predictors: 9
Response: EnergyConsumption
Validation: 5-fold cross-validation


Regression Learner - untitled*
LEARN
TEST
EXPLAIN
Open
Save
PCA
Optimizer
All Quick-To-Train
All
Linear
Use Parallel
Train All
Response
Predicted vs. Actual
Results Table
Layout
Export Plot
MODELS
TRAIN
PLOTS AND RESULTS
EXPORT
Models
Sort by
Model Number
Summary
Response Plot
Response Plot for Original data set: Energy_cons
Response (EnergyConsumption)
Temperature
Plot
True
Style
Markers
X-axis
Response EnergyConsumption

28


Regression Learner - untitled*
LEARN
TEST
EXPLAIN
New Session
Open
Save
FILE
Feature Selection
PCA
Optimizer
OPTIONS
All Quick-To-Train
All
Linear
MODELS
Use Parallel
Train All
TRAIN
Response
Predicted vs. Actual
Results Table
Layout
PLOTS AND RESULTS
Export Plot
Generate Function
Export Model
EXPORT
Models
Sort by Model Number
1 Tree
RMSE (Validation): 6.9338
Last change: Fine Tree
9/9 features
Model 1
Summary
Response Plot
Validation Predicted vs. Actual Plot
Validation Predicted vs. Actual Plot for Pr
Predicted response
True response
X 83.5018
Y 78.8028
Legend
Observation
Perfect pred
How to use the pre
actual plot
Data set: Energy consumption
Observations: 700
Size: 72 kB
Predictors: 9
Response: EnergyConsumption
Validation: 5-fold cross


TEST
EXPLAIN
Select File to Open
MATLAB Drive
Name
Energy_consumption.csv
Type
All Data Files (*.xls,*.xlsx,*.xlsm,*.csv,*.txt)
Open
Cancel


MATLAB Drive
drive.mathworks.com/files/
MATLAB Drive
Files
Open in MATLAB Online
Upload
New Folder
Download
Shared Content
Deleted Files
Name
Size
Date Modified
Modified By
Type
Owned By
archive.zip
Upload completed.
Upload completed. 1 file uploaded.
Energy_consumption.csv
Close
Total Items: 19

MATLAB Drive

Owned By: sahil shilawat

Access Type: Owner

Created On: Sat Dec 31 2022

Modified On: Wed Oct 23 2024

Modified By: sahil shilawat

Total Items: 18

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mran Akhade

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ATLAB Fundamentals

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20 October 2024