FALL SEM – (2020 – 21)

MAT2003

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LAB NO : 10

SLOT : L6

1. **Minimize the function f(x) = x^2 + 54/x using Fibonacci search method. ([a,b] = [0,5]).**

CODE:

```
clc;
clear all;
n=input('No of iterations : ');
a=input('Lower limit : ');
b=input('Upper limit : ');
fo=1;
fn=1;
func = @(x)(x^2+54/x);
for i=1:n+1
    if i==1 || i==2
    f(i)=1;
   continue;
    end
    f(i)=fo+fn;
    fo=fn;
    fn=f(i);
end
L2=(b-a)*f(n+1-2)/f(n+1);
j=2;
while j<n+1
L1=(b-a);
if L2>L1/2
    anew=b-L2;
    bnew=a+L2;
else if L2<=L1/2
        anew=a+L2;
        bnew=b-L2;
```

```
    end
end
k1=func(anew);
k2=func(bnew);
if k2>k1
    b=bnew;
    L2=f(n+1-j)*L1/f(n+1-j+2);
else if k2<k1
        a=anew;
        L2=f(n+1-j)*L1/f(n+1-(j-2));
    else if k2==k1
            b=bnew;
            L2=f(n+1-j)*[b-a]/f(n+1-(j-2));
            j=j+1;
        end
    end
end
j=j+1;
end
fprintf('[a,b] is reduced to the range of [%.3f,%.3f]',a,b);
```

OUTPUT:

```
No of iterations :
3
Lower limit :
0
Upper limit :
5
[a,b] is reduced to the range of [1.667,3.333]
>>
```

2. **Minimize the function $f(x) = x^2 + 54/x$ using Golden search method. ([a,b] = [0,5]).**

CODE:

```
clc;
clear all;
a=input('Lower limit : ');
b=input('Upper limit : ');
e = input("Enter any small number :");
f = @(x)(x^2+54/x);
k = 2;
a_new = a;
b_new = b;
Lw = b - a;
aw = (a_new - a)/(b - a);
bw = (b_new - a)/(b - a);
Lw = bw - aw;
w1 = aw + 0.618*Lw;
w2 = bw - 0.618*Lw;
y1 = feval(f,(w1));
y2 = feval(f,(w2));
while Lw >e
    aw = (a_new - a)/(b - a);
    bw = (b_new - a)/(b - a);
    Lw = bw - aw;
    w1 = aw + 0.618*Lw;
    w2 = bw - 0.618*Lw;
    if mod(Lw,2)==0
        y1 = feval(f,(w1));
    else
        y2 = feval(f,(w2));
    end
    if y1>y2
        a_new = w1;
    else
        b_new = w2;
    end
    c = 0.5*(a+b);
    k=k+1;
end
fprintf('The minimum value is %f\n',c)
```

OUTPUT:

```
Lower limit :
0
Upper limit :
5
Enter any small number :
0.0003
The minimum value is 2.500000
>>
```

3.

Newton Raphson Method.

Q:- Min $f(x) = 2x^2 + \frac{16}{x}$, with the initial point $x_1 = 1$.

Here $x_{k+1} = x_k - \frac{f'(x_k)}{f''(x_{k+1})}$

Here start from $k = 1$

CODE:

```
function lab10_2
i = input('Enter the value of i:');
p0 = input('Enter the initial value:');
N = input('No.of iterations:');
e = input('Enter any smallest value:');
syms 'x'
f(x) = 2*x^2 + 16/x
df = diff(f)
ddf = diff(df)
while i <= N
    p = p0 - (df(p0)/ddf(p0));
    if (abs(p - p0)/abs(p)) < e
        fprintf('Solution is %f and obtained in %d itertations\n',
double(p),i)
        return
    end
    i = i + 1;
    p0 = p;
end
end
```

OUTPUT:

```
>> lab10_2
Enter the value of i:
1
Enter the initial value:
1
No.of iterations:
2
Enter any smallest value:
0.2

f(x) =

16/x + 2*x^2


df(x) =

4*x - 16/x^2


ddf(x) =

32/x^3 + 4

Solution is 1.542857 and obtained in 2 itertations
>>
```