CS227 Assignment (15/11/23)

Name :- MOULIK JAIN
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1. Q. Minimize 12x^2 – 9xy + 6y^ 2 by SD Method with Initial Point (1,1)

```
%moulik jain
%2201cs49
syms x1 x2

function_1 = 12*x1^2 - 9*x1*x2 +6*x2^2 ;
%the function we need to minimize funcx inline (function_1); %making this function operable
funcx = inline(function_1) ;
funcobjec = @(x) funcx(x(:,1), x(:,2));
grad = gradient(function_1);
gradfuncx =inline(grad);
Hess1= hessian (function_1);
Hessx=inline (Hess1);
x0 = [1 1]; % initial value
maxiter =3; % maximum number of iterations
tolerance = 5e-3; %tolerance to check
iterator =0;
X=[]; %vector to save next data
gradx= @(x) gradfuncx(x(:,1), x(:,2));
while norm (gradx(x0)) > tolerance && iterator< maxiter
X= [X;x0];
Step_length = -gradx(x0);
H = Hessx(x0);
lambda = Step_length' *Step_length./(Step_length'*H*Step_length); %getting the optimum lambda
Xnew = x0+ lambda.*Step_length';
x0 =Xnew;
iterator = iterator +1; %looping
end
fprintf("The optimum Solution is = [%f, %f] \n", x0(1), x0(2));
fprintf("The optimum value of f(x) is= %f \n", funcobjec (x0));
```

```
>> untitled2
The optimum Solution is = [0.089136, 0.299819]
The optimum value of f(x) is= 0.394171
>>
```

2. Q. Minimize 18x - y + 51x ^2 + 21xy + y^ 2 by SD Method with Initial Point (1,1)

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```
%moulik jain
%2201cs49
syms x1 x2

function_1 = 18*x1 - x2 +51*x1^2 +21*x1*x2 +x2^2 ;
%the function we need to minimize funcx inline (function_1); %making this function operable
funcx = inline(function_1) ;
funcobjec = @(x) funcx(x(:,1), x(:,2));
grad = gradient(function_1);
gradfuncx =inline(grad);
Hess1= hessian (function_1);
Hessx=inline (Hess1);
x0 = [1 1]; % initial value
maxiter =3; % maximum number of iterations
tolerance = 5e-3; %tolerance to check
iterator =0;
X=[]; %vector to save next data
gradx= @(x) gradfuncx(x(:,1), x(:,2));
while norm (gradx(x0)) > tolerance && iterator< maxiter
X= [X;x0];
Step_length = -gradx(x0);
H = Hessx(x0);
lambda = Step_length' *Step_length./(Step_length'*H*Step_length); %getting the optimum lambda
Xnew = x0+ lambda.*Step_length';
x0 =Xnew;
iterator = iterator +1; %looping
end
fprintf("The optimum Solution is = [%f, %f] \n", x0(1), x0(2));
fprintf("The optimum value of f(x) is= %f \n", funcobjec (x0));
```

```
>> untitled2
The optimum Solution is = [0.301080, -2.324538]
The optimum value of f(x) is= 3.073252
>> X

X =

    1.0000    1.0000
   -0.3299    0.7925
    0.1599   -2.3466

>>
```