Exercise -5

Extend the following Genetic Algorithm code to have the following features:

1) To have a variable number of inputs
2) Lower and upper limits should be hard-coded
3) To have a variable population size
4) Objective function to be defined in a separate function
5) Solve any five objective functions using the GA with the following parameters:
    a. Population size=50
    b. Max_iterations=200

MATLAB code of the basic GA:

```
%----------A simple GA with population size 4 and dimension 2---------

clc

clear

minMax = input('Type "min" or max" :\n','s');

MaxIter = input('Please enter the total itaerations:\n');

str = input('Give the fitness function in x and y: ','s');

min_x = input('Give the minimum of x:\n');

max_x = input('Give the maximum of x:\n');

min_y = input('Give the minimum of y:\n');

max_y = input('Give the maximum of y:\n');

f = inline(str,'x','y');

%fitness evaluation

for i = 1:4

        x(i) = (max_x - min_x)*rand(1,1) + min_x;

        y(i) = (max_y - min_y)*rand(1,1) + min_y;

        fit(i) = (feval(f,x(i),y(i)));

end

iteration = 1;

while iteration < MaxIter

%seletion

array = [fit(1) fit(2) fit(3) fit(4)]

    if minMax == 'max'

        [sorted,index] = sort(array,'descend');
    else
        [sorted,index] = sort(array,'ascend');
    end
    fitness(iteration) = fit(index(1));
    no(iteration) = iteration;
%crossover
        x(index(3)) = x(index(1));
        y(index(3)) = y(index(2));
        x(index(4)) = x(index(2));
        y(index(4)) = y(index(1));
%mutation
        rand_num = randi([1 2],1,1);
        if rand_num == 1
            x(index(4)) = (max_x - min_x)*rand(1,1) + min_x;
        else
            y(index(4)) = (max_y - min_y)*rand(1,1) + min_y;
        end
%fitness evaluation
    for i = 1:4
            fit(i) = (feval(f,x(i),y(i)));
    end
   iteration = iteration + 1;
end
disp('the best value for x is')
disp(x(index(1)));
disp('the best value for y is')
disp(y(index(1)));

plot(no(1:MaxIter-1),fitness(1:MaxIter-1),'Linewidth',2,'Color','r')
ylabel('Fitness','FontSize',15);
xlabel('Iteration','FontSize',15);
```