**Search agents number = 4**

**Beta = 1000000**

**Intiliaziation : Positions**=randi(SearchAgents\_no,dim).\*(ub-lb)+lb;

**To**

Positions=randi(SearchAgents\_no,dim);

**Gwo function**

function [Alpha\_score,Alpha\_pos,Convergence\_curve]=GWO(SearchAgents\_no,Max\_iter,lb,ub,dim,fobj)

**See the outputs**

%% fitness function

fobj = @F10;

beta = 1000;

number\_of\_test = 30;

excel\_ouput = zeros(4,number\_of\_test);

for i = 1 : number\_of\_test

%% algorithm

tic

[Best\_score,Best\_pos,GWO\_cg\_curve]=GWO(SearchAgents\_no,Max\_iteration,lb,ub,dim);

tend = toc;

excel\_ouput(1,i) = i;

excel\_ouput(2,i) = tend;

excel\_ouput(3,i) = sum(Best\_pos>1);

[lll,llllll] = min(GWO\_cg\_curve);

excel\_ouput(4,i) = llllll;

excel\_ouput(5,i) = Best\_score;

end

format long

numbers\_of\_failed\_divergance = 0 ;

for i = 1 : number\_of\_test

if excel\_ouput(5,i) > beta

numbers\_of\_failed\_divergance = numbers\_of\_failed\_divergance +1 ;

excel\_ouput(5,i) = -1;

end

end

for i = 1 : number\_of\_test

if excel\_ouput(5,i) == -1

excel\_ouput(5,i) = max(excel\_ouput(5,:));

i

max(excel\_ouput(5,:))

end

end

excel\_ouput(:,number\_of\_test+1) = mean(excel\_ouput,2);

excel\_ouput(:,number\_of\_test+2)=std(excel\_ouput,0,2);

excel\_ouput(2,number\_of\_test+3) =numbers\_of\_failed\_divergance;

excel\_ouput(4,number\_of\_test+3) = excel\_ouput(2,number\_of\_test+1)\* excel\_ouput(4,number\_of\_test+1)/Max\_iteration;

%% output generation

string excel\_string\_ouput;

excel\_string\_ouput = string(excel\_ouput);

excel\_string\_ouput(1,number\_of\_test+1) ="mean";

excel\_string\_ouput(1,number\_of\_test+2) ="standard deviation";

excel\_string\_ouput(1,number\_of\_test+3) ="failed divergance ";

excel\_string\_ouput(3,number\_of\_test+3) =" mean time for mean itteration ";

excel\_string\_ouput(5,number\_of\_test+3) ="";

excel\_string\_ouput(:,(2 : number\_of\_test+4)) = excel\_string\_ouput;

excel\_string\_ouput(1,1) = "test";

excel\_string\_ouput(2,1) = "time";

excel\_string\_ouput(3,1) = "sinks used";

excel\_string\_ouput(4,1) = "divergance";

excel\_string\_ouput(5,1) = "energy";