**clc**

**clear**

**close all**

**format shortG**

**%% parameters setting**

**nvar=input(' Number of Queen = ');% number of variable**

**npop=100;% number of population**

**maxiter=5000; % max of iteration**

**pc=0.7;% percent of cross over**

**ncross=2\*round(npop\*pc/2); % number of cross over**

**pm=.29; % percent of mutation**

**nmut=round(npop\*pm);% number of mutation**

**nrep=npop-ncross-nmut;% number of reproduction**

**%% inialization**

**tic**

**empty.pos=[]; % position**

**empty.cost=[]; % cost**

**pop=repmat(empty,npop,1);% population matrix**

**for i=1:npop**

**pop(i).pos=randperm(nvar);**

**pop(i).cost=fitness(pop(i).pos,nvar);**

**end**

**[value index]=sort([pop.cost]);**

**%% main loop**

**best=1000\*ones(maxiter,1);**

**AVR=1000\*ones(maxiter,1);**

**%Bad=realmax\*ones(maxiter,1);**

**iter=0;**

**while value(1)>0**

**iter=iter+1;**

**% cross**

**crosspop=repmat(empty,ncross,1);**

**crosspop=crossover(crosspop,pop,nvar,ncross);**

**% mutation**

**mutpop=repmat(empty,nmut,1);**

**mutpop=mutation(mutpop,pop,nvar,nmut);**

**% reproduction**

**reppop=pop(index(1:nrep));**

**% merged**

**[pop]=[reppop;**

**crosspop;**

**mutpop];**

**[value index]=sort([pop.cost]);**

**%pop=pop(index(1:npop));**

**best(iter)=value(1);**

**AVR(iter)=mean([pop.cost]);**

**disp([ 'Iter = ' num2str(iter) ' BEST = ' num2str(value(1))])**

**end**

**%% results**

**figure(1)**

**plotsolution(pop(index(1)).pos,nvar);**

**disp('===========================================')**

**disp([ 'Time = ' num2str(toc)])**

**disp('===========================================')**

**disp([ 'Best fitness = ' num2str(value(1))])**

**disp('===========================================')**

**disp([ 'Best Solution = ' num2str(pop(index(1)).pos)])**

**% figure(2)**

**% plot(best(1:iter),'g','LineWidth',2)**

**% hold on**

**% plot(AVR(1:iter),'m','LineWidth',2)**

**%**

**% legend('BEST','MEAN')**

**% xlabel('Iteration')**

**% ylabel('Fitness')**

**% title(' GA for TSP ')**