COMSATS University Islamabad Lahore Campus

Assignment III – FALL 2020

Course Title:	Artificial Intelligence				Course Code:	CSC462	Credit Hours:	3(2,1)
Course Instructor/s:	Dr. Atifa Athar				Programme Name:	BS Computer Science		
Semester:	7th	Batch:	FA17	Section:	A, B, C	Date:	15-12-2020	
Due on	**22-12-2020**				**Maximum Marks:**		**10**	
Name & Registration no: Aamna Majid FA17-BCS-081								

- **No late submissions will be accepted.**
- **All assignments are required to be submitted using attached template only.**

Question No. 1 **Marks: 10**

Solve 8-queen Problem using Genetic Algorithm. Consider minimal conflict among queens as the Fitness function

Solution:

The best optimal solution is when total fitness = 28 which means there is minimal conflict among queens.

Generating initial population

A:

3	2	7	5	2	8	6	4

Fitness = no of non-attacking pairs

					Q8		
		Q3					
						Q6	
			Q5				
							Q4
Q_1							
	Q_2			Q2			

Queen 1: 5

Queen 2: 5

Queen 3: 5

Queen 4: 4

Queen 5: 3

Queen 6: 2

Queen 7: 1

Queen 8: 0

Total fitness: 25

B:

7	2	7	5	2	4	6	1

Fitness = no of non-attacking pairs

Q_1		Q3					
						Q7	
			Q4				
					Q6		
	Q_2			Q5			
							Q8

Queen 1: 6

Queen 2: 5

Queen 3: 4

Queen 4: 3

Queen 5: 3

Queen 6: 2

Queen 7: 1

Queen 8: 0

Total fitness: 24

C:

3	2	8	5	2	4	6	1

Fitness = no of non-attacking pairs

		Q3					
						Q7	
			Q4				
					Q6		
Q_1							
	Q_2			Q5			
							Q8

Queen 1: 6

Queen 2: 5

Queen 3: 5

Queen 4: 3

Queen 5: 3

Queen 6: 2

Queen 7: 1

Queen 8: 0

Total fitness: 25

Crossover

A:

3	2	7	5	2	8	6	4

C:

3	2	8	5	2	4	6	1

New Population:

D:

3	2	8	5	2	8	6	4

E:

3	2	7	5	2	4	6	1

Mutation:

F:

3	2	8	7	2	8	6	4

G:

3	2	7	5	2	4	6	8

Next Generation:

Calculating fitness Of F:

		Q3			Q6		
			Q4				
						Q7	
							Q8
Q_1							
	Q_2			Q5			

Queen 1: 5

Queen 2: 5

Queen 3: 3

Queen 4: 4

Queen 5: 3

Queen 6: 2

Queen 7: 1

Queen 8: 0

Total fitness: 23

Calculating fitness Of G:

3	2	7	5	2	4	6	8

							Q8
		Q3					
						Q7	
			Q4				
					Q6		
Q_1							
	Q_2			Q5			

Queen 1: 6

Queen 2: 4

Queen 3: 4

Queen 4: 4

Queen 5: 3

Queen 6: 2

Queen 7: 1

Queen 8: 0

Total fitness: 24

Crossover:

C:

3	2	8	5	2	4	6	1

F:

3	2	8	7	2	8	6	4

New Population:

H:

3	2	8	5	2	4	6	1

I:

3	2	8	7	2	8	6	4

Mutation:

J:

3	1	8	5	2	4	6	1

K:

3	2	1	7	2	8	6	4

Next generation:

J:

3	1	8	5	2	4	6	1

		Q3					
						Q7	
			Q4				
					Q6		
Q_1							
				Q5			
	Q_2						Q8

Queen 1: 7

Queen 2: 4

Queen 3: 5

Queen 4: 3

Queen 5: 3

Queen 6: 2

Queen 7: 1

Queen 8: 0

Total fitness: 25

K:

3	2	1	7	2	8	6	4

					Q6		
			Q4				
						Q7	
							Q8
Q_1							
	Q_2			Q5			
		Q3					

Queen 1: 5

Queen 2: 4

Queen 3: 5

Queen 4: 4

Queen 5: 3

Queen 6: 2

Queen 7: 1

Queen 8: 0

Total fitness: 24

Crossover

J:

3	1	8	5	2	4	6	1

K:

3	2	1	7	2	8	6	4

New Population:

L:

3	2	8	5	2	4	6	1

M:

3	1	1	7	2	8	6	4

Mutation:

N:

3	4	8	5	2	4	6	1

O:

5	1	1	7	2	8	6	4

Next generation:

N:

3	4	8	5	2	4	6	1

		Q3					
						Q7	
			Q4				
	Q_2				Q6		
Q_1							
				Q5			
							Q8

Queen 1: 6

Queen 2: 5

Queen 3: 5

Queen 4: 3

Queen 5: 3

Queen 6: 2

Queen 7: 1

Queen 8: 0

Total fitness: 25

O:

5	1	1	7	2	8	6	4

					Q6		
			Q4				
						Q7	
Q_1							
							Q8
				Q5			
	Q_2	Q3					

Queen 1: 7

Queen 2: 4

Queen 3: 5

Queen 4: 4

Queen 5: 3

Queen 6: 2

Queen 7: 1

Queen 8: 0

Total fitness: 26

Crossover

K:

3	2	1	7	2	8	6	4

O:

5	1	1	7	2	8	6	4

P:

5	1	1	7	2	8	6	4

Q:

3	2	1	7	2	8	6	4

Mutation:

R:

5	3	1	7	2	8	6	4

S:

5	2	1	7	2	8	6	4

Calculating Fitness of R:

5	3	1	7	2	8	6	4

					Q6		
			Q4				
						Q7	
Q_1							
							Q8
	Q_2						
				Q5			
		Q3					

Queen 1: 7

Queen 2: 6

Queen 3: 5

Queen 4: 4

Queen 5: 3

Queen 6: 2

Queen 7: 1

Queen 8: 0

Total fitness: 28

Required Fitness Solution:

5	3	1	7	2	8	6	4