Assignment - 03

Genetic Algorithm

My age is 22. and my Id is 17101007

Let's consider,

A = 1st digit of my Age. = 2

B = (2nd digit of Age mod last two digit of my Id) + 1

= (2 % 07) + 1 = 2 + 1 = 3

C = A + 1 = 2 + 1 = 3

D = (B mod 3) + 1 = (3 % 3) + 1 = 0 + 1 = 1

Given, $f(x) = 2x - 1$

$\therefore f(A) = 2*2 - 1 = 4 - 1 = 3$

$f(B) = 2*3 - 1 = 6 - 1 = 5$

$f(C) = 2*3 - 1 = 6 - 1 = 5$

$f(D) = 2*1 - 1 = 1$

So, we have 4 population A, B, C, D

In this case, the range of x is 1~5. So I am using a 4-bit representation.

$f(x) = 2x - 1$: Selection

String No.	Initial Population	x Value	Fitness $f(x) = 2x-1$	Probability (i)	Expected Count	Actual Count
1(A)	0010	2	3	0.21	0.84	1
2(B)	0011	3	5	0.36	1.44	2 (Taking Ceilling)
3(C)	0011	3	5	0.36	1.44	1
4(D)	0001	1	1	0.07	0.28	0
	Sum →		14	1.00	4.00	4
	Average →		3.50	0.25	1.00	1
	Max →		5	0.36	1.44	2

Here, I am taking Ceilling value for the Actual count of B to make sure that the total no. of population is 4.

Calculation of Probability: $\left(\frac{\text{Fitness Value}}{\text{Sum of fitness value}}\right)$

$$P(A) = \frac{3}{14} = 0.21$$

$$P(B) = \frac{5}{14} = 0.36$$

$$P(C) = \frac{5}{14} = 0.36$$

$$P(D) = \frac{1}{14} = 0.07$$

Calculation of Expected Count: (Probability x Total no. of population)

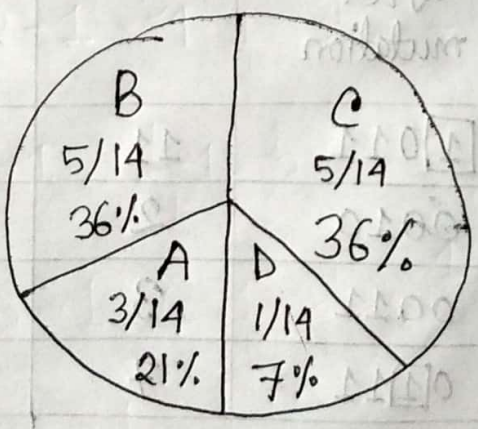
$0.21 \times 4 = 0.84$

$0.36 \times 4 = 1.44$

$0.36 \times 4 = 1.44$

$0.07 \times 4 = 0.28$

Roulette Wheel:



$f(x) = 2x - 1$: Crossover

String No.	Mating Pool	Crossover point	Offspring after crossover	x Value	Fitness $f(x) = x^2$
1 (A)	001|0	3	0011	3	5
2 (B)	001|1	3	0010	2	3
2 (B)	00|11	2	0011	3	5
3 (C)	00|11	2	0011	3	5
				Sum →	18
				Average →	4.50
				Max →	5

$f(x) = 2x - 1$: Mutation

String No.	Offspring after crossover	Offspring after mutation	x Value	Fitness $f(x) = 2x - 1$
1 (A)	0011	[1]011	11	21
2 (B)	0010	0010	2	3
2 (B)	0011	0011	3	5
3 (C)	0011	0[1]11	7	13
			Sum →	42
			Average →	10.50
			Max →	21