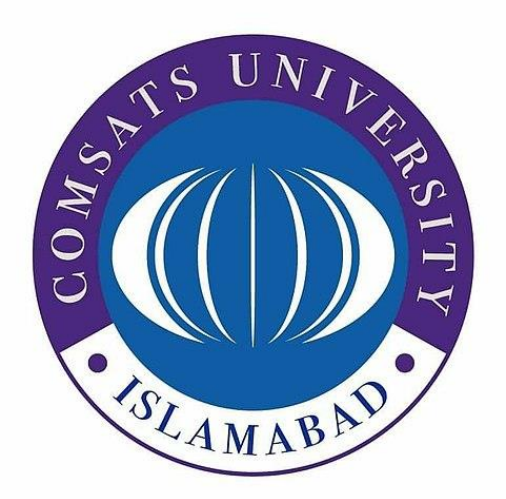


COMSATS UNIVERSITY ISLAMABAD, ABBOTTABAD CAMPUS

Assignment # 01 – Artificial intelligence

Submitted by:

Laiba Binte Tahir

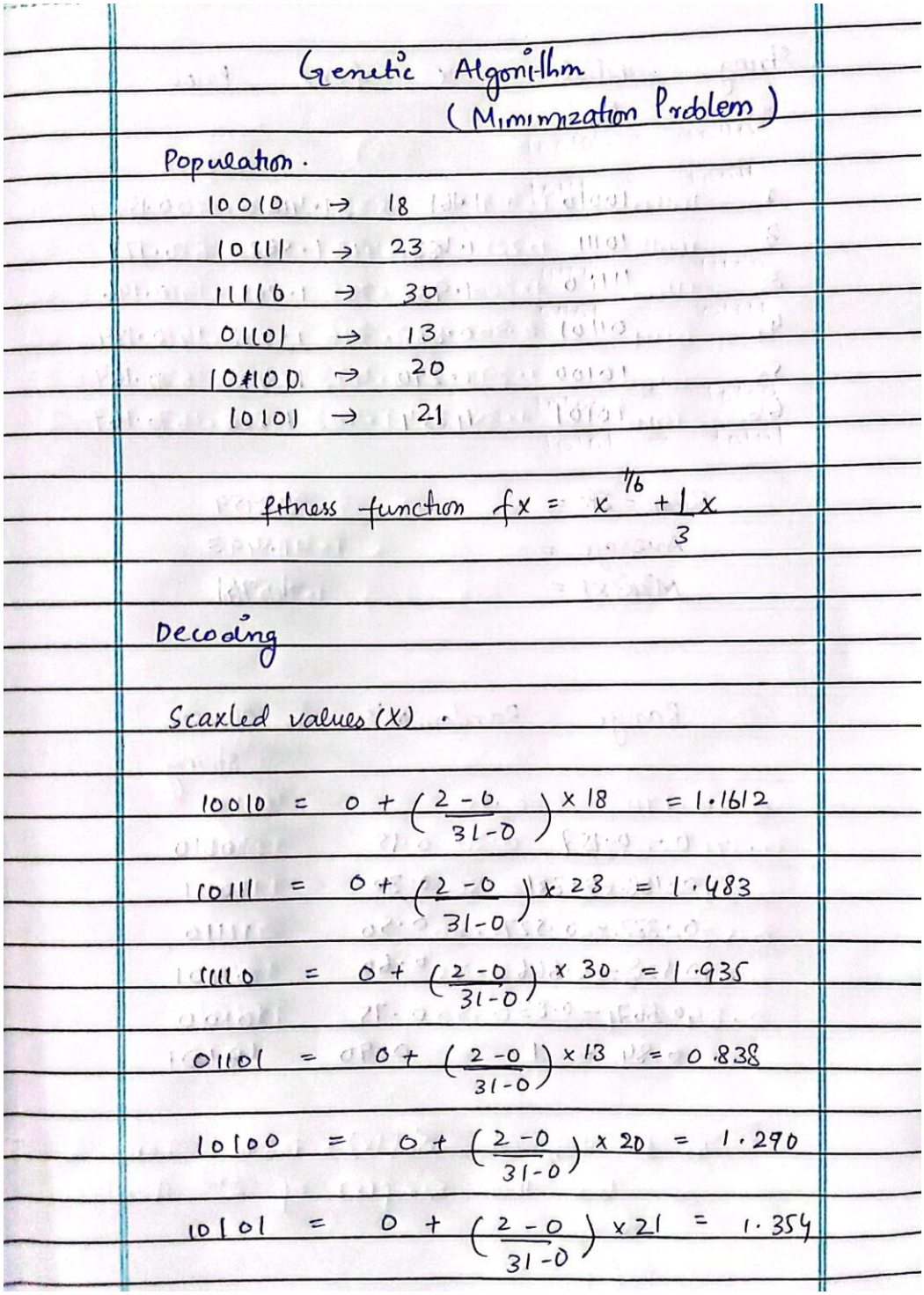
FA21-BSE-019-6A

Submitted To:

Dr. Mubashir Ahmad

Genetic Algorithm (Minimization Problem)

*Minimize the value of the function F(X) = X1/6 + 1/3 * X, over the range of real number from 0 to 2 with initial population ['10010', '10111', '11110', '01101', '10100', '10101'] and with random numbers [0.15, 0.30, 0.50, 0.60, 0.75, 0.90], adjust the numbers in range of 0 to 2. Select the crossover between the first and fifth digits. Run the algorithm in 2 iterations.*



Genetic Algorithm
(Minimization Problem)

Population.

10010 → 18
10111 → 23
11110 → 30
01101 → 13
10100 → 20
10101 → 21

fitness function $fx = x^{1/6} + \frac{1}{3}x$

Decoding

Scaled values (X).

$10010 = 0 + \left(\frac{2-0}{31-0}\right) \times 18 = 1.1612$

$10111 = 0 + \left(\frac{2-0}{31-0}\right) \times 23 = 1.483$

$11110 = 0 + \left(\frac{2-0}{31-0}\right) \times 30 = 1.935$

$01101 = 0 + \left(\frac{2-0}{31-0}\right) \times 13 = 0.838$

$10100 = 0 + \left(\frac{2-0}{31-0}\right) \times 20 = 1.290$

$10101 = 0 + \left(\frac{2-0}{31-0}\right) \times 21 = 1.354$

DATE: __/__/____ FA21-BSE-019 DATE: __/__/____

String No.	Initial Pop.	x	f(x)	Prob	cdf	Range
1	10010	1.161	1.412	0.157	0.157	0 – 0.157
2	10111	1.483	1.562	0.174	0.331	0.158 – 0.331
3	11110	1.935	1.761	0.196	0.527	0.332 – 0.527
4	01101	0.835	1.248	0.139	0.666	0.528 – 0.666
5	10100	1.290	1.473	0.164	0.83	0.667 – 0.83
6	10101	1.354	1.503	0.167	1	0.84 – 1

Sum = $\Sigma f(x)$ = 8.959

Average = 1.493

Max $f(x)$ = 1.248

2nd iteration

Range	Random No's	Choosen String
0 – 0.157	0.15	10010
0.158 – 0.331	0.30	10111
0.332 – 0.527	0.50	11110
0.528 – 0.666	0.60	01101
0.667 – 0.83	0.75	10100
0.84 – 1	0.90	10101

Cross over

10010 → 10110
10111 → 10011

11110 → 11100
01101 → 01111

10100 → 10100
10101 → 10101

2nd Iteration

10110 → 22
10011 → 19
11100 → 28
01111 → 15
10100 → 20
10101 → 21

Decoding

10110 = 2/31 x22

10011 = 2/31 x19

11100 = 2/31 x 28

01111 = 2/31 x15

10100 = 2/31 x20

10101 = 2/31 x21

DATE: __/__/____

fa21-BSE-019

String No	Pop.	X	f(x)	Prob fx/Σfx	cdf
1	10110	1.419	1.533	0.170	0.170
2	10011	1.225	1.442	0.160	0.33
3	11100	0.806	1.705	0.190	0.52
4	01111	0.967	1.316	0.146	0.66
5	10100	1.290	1.473	0.164	0.83
6	10101	1.354	1.503	0.167	1.

Sum (Σfx) = 8.972

Average = 1.495

Min (f(x)) 1.316

Range	Random No's	String selected
0 – 0.170	0.15	10110
0.171 – 0.33	0.30	10011
0.34 – 0.52	0.50	11100
0.53 – 0.66	0.60	01111
0.67 – 0.83	0.75	10100
0.84 – 1	0.90	10101

In 1st iteration Min f(x) = 1.248 which is less than Min f(x) of 2nd iteration