**Analysis of Genetic Algorithm**

Consider a fitness function

Maximize the value of this function. X is in the interval [0-31]

1. Selection of chromosomes. Consider 4 numbers

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| S.No | Value | Binary | F(x) |  | Expected Probability |
| A | 13 | 01101 | 169 | 0.14 | 0.56 |
| **B** | **24** | **11000** | **576** | **0.49** | **1.97** |
| C | 8 | 01000 | 64 | 0.06 | 0.22 |
| D | 19 | 10011 | 361 | 0.31 | 1.23 |
|  | Sum |  | 1170 | 1.0 | 4.0 |

1. Crossover operation

Discard chromosome number C as it has lowest probability.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| S.No | Binary | Crossover  point | Offspring  After crossover | Value | F(x) |
| A | 01101 | 4 | 01100 | 12 | 144 |
| B | 11000 | 4 | 11001 | 25 | 625 |
| B | 11000 | 2 | 11011 | 27 | 729 |
| D | 10011 | 2 | 10000 | 16 | 256 |
|  |  | Sum |  |  | 1754 |

Note that Sum is increased from 1170 to 1754

1. Mutation Operation: Keep the two chromosome same as previous as they have shown better fitness. In mutation operation, flip the bits of the chromosomes in a random manner.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| S.No | Binary | Offspring  After Mutation | Value | F(x) |
| A | 01100 | 11100 | 26 | 676 |
| B | 11001 | 11001 | 25 | 625 |
| B | 11011 | 11011 | 27 | 729 |
| D | 10000 | 10100 | 18 | 324 |
|  |  |  |  | 2354 |

The crossover and mutation is completed in one iteration. The GA conducts such n iterations or till the desired results is found.