Assignment 2

The due date for submitting this assignment has passed. Due on 2018-02-21, 23:59 IST.

Submitted assignment

1) To ensure an efficient search of a binary-coded genetic algorithm (GA) for solving an optimization problem involving five variables, its parameters are to be set as follows:

(a) Small population size, low probability of crossover, high probability of mutation
(b) Large population size, high probability of crossover, low probability of mutation
(c) Large population size, low probability of crossover, low probability of mutation
(d) Small population size, high probability of crossover, high probability of mutation

No, the answer is incorrect.
Score: 0
Accepted Answers:
(b) Large population size, high probability of crossover, low probability of mutation

2) Let us consider a schema (template) of a binary-coded GA, as given below.

\[ H = 1 \ast \ast \ast \ast \ast 0 \ast \ast \]

Its order and defining length are calculated as follows:

(a) 8 and 3
(b) 3 and 4
(c) 2 and 6
(d) 6 and 2

No, the answer is incorrect.
Score: 0
Accepted Answers:
(c) 2 and 6

3) Let us consider a schema (template) of a binary-coded GA, as given below.

\[ H = 1 \ast \ast \ast \ast \ast 1 \ast \ast \]

Let us also assume that probability of crossover, \( p_c \) = 1.0.

The probability of destruction of this schema due to a single-point crossover is given by

(a) 2/3
(b) 1/4
Let us consider a schema (template) of a binary-coded GA, as given below.
\[ H = * * 1 * * * 0 * * * \]
Let us also assume that probability of mutation, \( p_m = 0.01 \). Its probability of survival due to bit-wise mutation is calculated as

- (a) 0.96
- (b) 0.85
- (c) 0.98
- (d) 0.95

No, the answer is incorrect.
Score: 0
Accepted Answers:
(c) 0.98

5) To solve an optimization problem using a real-coded genetic algorithm (RCGA), let us assume that a mating pair is found to be as follows:
\[ P_{r1} = 20.48 \]
\[ P_{r2} = 10.50 \]
The children solutions are to be determined using Simulated Binary Crossover (SBX) by assuming the probability distributions for the contracting and expanding zones as follows:
\[ C(\alpha) = 0.5(q + 1)\alpha^q \]
\[ EX(\alpha) = 0.5(q + 1) \frac{1}{\alpha^{q+2}} , \]
where \( \alpha \) is a spread factor and take \( q=5 \). Assume the random number \( r = 0.4 \). The children solutions are approximately calculated as follows:
- (a) 22.05, 11.55
- (b) 18.05, 12.08
- (c) 20.28, 10.70
- (d) 23.51, 12.52

No, the answer is incorrect.
Score: 0
Accepted Answers:
(c) 20.28, 10.70

6) In a real-coded GA, let us use polynomial mutation to determine a mutated solution from the original parent solution \( P_r = 20.50 \). Let us assume the random number \( r = 0.4 \) for which the perturbation factor \( \tilde{\delta} = (2r)^{\frac{1}{q+1}} - 1 \), where the exponent \( q \) is set equal to 4. Assume \( \delta_{\text{max}} = 1.5 \).
The mutated solution is approximately found to be equal to
- (a) 18.50
- (b) 22.80
- (c) 23.50
- (d) 20.43

No, the answer is incorrect.
Score: 0
Accepted Answers:
7) Let us consider a constrained optimization problem as given below

Minimize \( f(x_1, x_2) = x_1^2 + x_2^2 - x_1 x_2 + x_1 + x_2 \)

subject to \( x_1 + x_2 > 10.0 \)
\( x_1^2 - x_2^2 + x_1 x_2 > 20.0 \)
and \( 0.0 \leq x_1, x_2 \leq 10.0 \)

Let us try to solve this problem using the concept of static penalty approach. Take \( x_1 = 5.0, x_2 = 8.0 \). Use the constants \( C_1 \) and \( C_2 \) as 10.0 and 15.0 respectively. Penalty term is found to be equal to

- (a) 1005
- (b) 1000
- (c) 0
- (d) 5415

No, the answer is incorrect.
Score: 0
Accepted Answers:
(d) 5415

8) Let us consider a constrained optimization problem as given below

Minimize \( f(x_1, x_2) = x_1^2 + x_2^2 - x_1 x_2 + x_1 + x_2 \)

subject to \( x_1 + x_2 > 10.0 \)
\( x_1^2 - x_2^2 + x_1 x_2 > 20.0 \)
and \( 0.0 \leq x_1, x_2 \leq 10.0 \)

Let us try to solve this problem using the concept of dynamic penalty. Take \( x_1 = 5.0, x_2 = 8.0 \). Assume the constants \( C = 10, \alpha = 2, \beta = 3 \).
Penalty term is found to be equal to

- (a) 1,00,000
- (b) 2,25,000
- (c) 52,805
- (d) 6,85,900

No, the answer is incorrect.
Score: 0
Accepted Answers:
(d) 6,85,900

9) Let us consider a constrained optimization problem, as given below

Minimize \( f(x_1, x_2) = x_1^2 + x_2^2 - x_1 x_2 + x_1 + x_2 \)

subject to \( x_1 + x_2 > 10.0 \)
\( x_1^2 - x_2^2 + x_1 x_2 > 20.0 \)
and \( 0.0 \leq x_1, x_2 \leq 10.0 \)

Let us try to solve this problem using the concept of adaptive penalty. Take \( x_1 = 5.0, x_2 = 8.0 \). Assume the constants \( \lambda(0) = 100, \beta_1 = 2, \beta_2 = 3 \).
Penalty term is found to be equal to

- (a) 90,850
- (b) 1,10,700
- (c) 85,950
- (d) 1,08,750

(d) 20.43
10. Crossover is a more powerful operator than Mutation in terms of

- (a) Construction capability in the search
- (b) Disruption capability in the search
- (c) Both construction and disruption capabilities
- (d) None of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
(a) Construction capability in the search