

Introduction to Soft Computing

Assignment 6

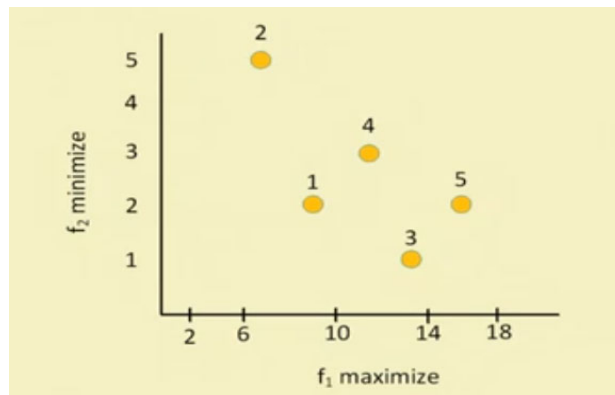
TYPE OF QUESTION: MCQ

Number of questions: 10

Total mark: $10 \times 1 = 10$

QUESTION 1:

Consider a 2-objective optimization problem where one of the objective functions, say f_1 , needs to be maximized and the other objective function f_2 needs to be minimized. Five candidate solutions belonging to the solution space of this problem are shown below.

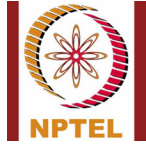


Which of the following statements is wrong?

- a. Solution 3 dominates solution 1
- b. Solution 2 is dominated by all other solutions
- c. Solution 5 dominates solution 3
- d. Solution 1 and solution 4 do not dominate one another.

Correct Answer: c

Explanation: Solution 5 is better than solution 3 with respect to f_1 , but solution 5 is worse than solution 3 with respect to f_2 . So, solution 5 and solution 3 do not dominate each other. Other statements are correct.



QUESTION 2:

Which of the following techniques to solve a MOOP follows dominance-based ranking followed by fitness averaging?

- a. MOGA.
- b. SOEA
- c. SGA.
- d. VEGA.

Correct Answer: a

Explanation: Multi-Objective Genetic Algorithm (MOGA) follows dominance-based ranking for ordering and for scaling, MOGA follows linearized fitness assignment and fitness averaging.

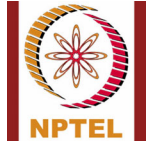
QUESTION 3:

Which of the following statements is not correct for Vector Evaluated Genetic Algorithm (VEGA)?

- a. VEGA can be implemented in the same framework as Simple Genetic Algorithm (SGA), with a modification of the selection operation.
- b. VEGA leads to a solution close to local optima with regard to each individual objective function
- c. VEGA generates solutions that are necessarily both locally and globally non-dominated across the entire population.
- d. VEGA selects individuals which excel in one objective, without looking at the other individuals.

Correct Answer: c

Explanation: The solutions generated by VEGA are locally non-dominated but not necessarily globally dominated. The dominance is limited to current population only. Detailed explanation can be found in week 6 lecture 28 video material.



QUESTION 4:

A three-objective optimizations are solved using a MOEA algorithm and a few objective vectors are listed below.

(Assume all objectives are to be minimized)

[3, 5, 10], [5, 3, 10], [3, 10, 5], [10, 5, 3], [10, 3, 5]. Which of the following is true?

- a. All are non-dominating solutions.
- b. Solution[3, 5, 10] dominates all other solution.
- c. Solution[10, 5, 3] dominated by the solution[3, 5, 10].
- d. Solution[3, 10, 5] dominates solution[5, 3, 10].

Correct Answer: a

Explanation: According to the objective function (to be minimized), no solution satisfies the minimization condition for three-objective optimizations. Hence, all are non-dominating solutions

QUESTION 5:

If c_1 and c_2 are two offspring chromosomes, then according to NPGA, c_1 will be preferable to be selected for mating pool if

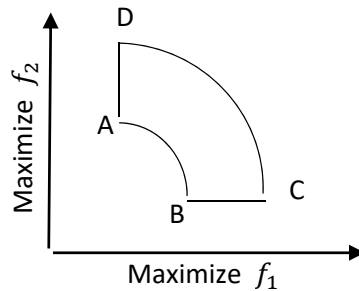
- a. if c_1 's niche count is higher than that of c_2 .
- b. if c_1 's niche count is equal to niche count of c_2 .
- c. if c_1 's niche count is lower than that of c_2 .
- d. None of the above

Correct Answer: c

Explanation: The detailed description is given in Week 6 lecture material 30, page no. 18 and 19.

QUESTION 6:

A solution space for a 2-objective optimization problem is shown in the following graph.



The Pareto-optimal front in this regard is given by the curve

- a. AB
- b. CD
- c. AB + AD
- d. BC + CD

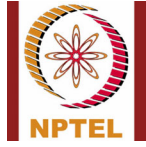
Correct Answer: b

Explanation: As both the objective functions need to be maximized, the curve CD is the overall non-dominated front. Detailed explanation is given in week 6 lecture 1 video material.

QUESTION 7:

In MOGA approach, if one individual solution x_i is dominated by p_i individual solutions in the current generation, then the rank of x_i is -

- a. $1/p_i$
- b. p_i
- c. $p_i - 1$
- d. $p_i + 1$



Correct Answer: c

Explanation: In MOGA approach, dominance-based ranking is used and the rank is given by $(p_i + 1)$. More detailed explanation can be found in week 6 lecture 4 video material.

QUESTION 8:

A priori high-level information that is required in Lexicographic ordering is

- a. the scalar weights of each objective function.
- b. the descending ordering of the rank of the importance of objective functions.
- c. Independent of the relative importance between the objective functions
- d. None of the above

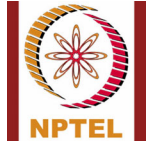
Correct Answer: b

Explanation: In lexicographic ordering approach, all the objective functions are ranked in the order of their importance. So, this high-level apriori information is required for this method.

QUESTION 9:

In Single Objective Evolutionary Algorithm to solve MOOP -

- a. All the objective functions are added together using different weighting coefficients for each objective.
- b. Each objective function is multiplied with another objective function using different weighting coefficients for each objective.
- c. Adding all objective functions together using same weighting coefficients for each objective.
- d. Multiplying each objective function with another objective function using same weighting coefficients for each objective.



Correct Answer: a

Explanation: The detailed solution is given in week 6 lecture material page no 40

QUESTION 10:

Which of the following technique suffers from speciation problem?

- a. MOEA
- b. VEGA
- c. NPGA
- d. NSGA

Correct Answer: b

Explanation: In VEGA approach, individuals, who excels in one objective function is selected while individuals excelling to solve other objective functions are ignored. This leads to evolution of “species” within the population, which is termed as speciation.

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