Introduction to Soft Computing

Assignment 7

TYPE OF QUESTION: MCQ

Number of questions: 10 **Total mark: 10 × 1 = 10**

QUESTION 1: Which MOGA technique uses Crowding distance to select a better solution?

a. NPGA
b. NSGA-II
c. NSGA
d. Simple GA

Correct Answer: b

Explanation: In NSGA-II, the solution which will make the diversity of the selected solutions the highest are chosen. This is accomplished by calculating crowding distance of solutions in the last acceptable front. The detailed description is given in Week 7 lecture– page no 35.

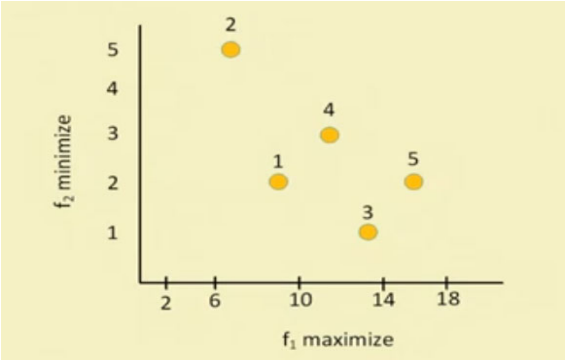
QUESTION 2: In NSGA, dummy fitness values are assigned to each individual solution belonging to a particular non-dominated front. These dummy fitness values are usually kept-

a. Very small and inversely proportional to the population size
b. Very small and proportional to the total number of objective functions
c. Very large and proportional to the total number of non-dominated fronts
d. Very large and proportional to the population size

Correct Answer: d

Explanation: The detailed Solution is available in Week 7 lecture material page number 13.

QUESTION 3: **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 in below figure.**



Which of the following statements is correct about the dominance relationships and the non-dominated fronts of the above solutions?

a. Solutions [1, 3] form a non-dominated front

b. The best non-dominated front is [2]

c. The ordering of solution fronts in terms of their non-domination level is [2,4,5], [1,3]

d. The ordering of solution fronts in terms of their non-domination level is [3,5], [1,4], [2]

Correct Answer: d

Explanation: In this problem, f_1 is to be maximized and $f_2$to be minimized. So, the solution [2] is dominated by all other solutions and the worst non-dominated front. [1,3] does not form a front because solution 3 dominates solution 1. [3, 5] is the best non-dominated front. So, the ordering of the solution fronts in terms of their non-domination level is [3,5], [1,4], [2]. The detailed Solution is available in Week 7 video lecture 1 about the NSGA approach.

QUESTION 4:

As per the crowding comparison operator, which of the following statements is wrong?

a. A solution x_i is selected over another solution x_j *if dominance rank(x_i) < rank(x_j)*

b. A solution x_i is selected over another solution x_j *if rank(x_i) = rank(x_j) and crowding distance of x_i (d_i) < crowding distance of x_j (d_j)*

c. A solution x_i is selected over another solution x_j *if rank(x_i) = rank(x_j) and crowding distance of x_i (d_i) > crowding distance of x_j (d_j)*

d. None of the above

Correct Answer: b

Detailed Solution: Dominance rank(x_i) < rank(x_j) signifies that x_i lies on a better non-domination front. If the ranks of the two solutions are same, then the solution with higher crowding distance will be selected. The detailed Solution is available in Week 7 lecture 3 video material.

QUESTION 5: Which of the following logic cannot be modeled with a single neuron?

a. $3 - AND$
b. $3 - XOR$
c. NOT
d. *3 - OR*

Correct Answer: b

Explanation: XOR is a non-linearly separable problem. Hence, it cannot be solved with a single neuron. The detailed description is given in Week 7 lecture material – page no 96

QUESTION 6:

Suppose, in a MOOP, there are m different objective functions and n is the initial population size. The NSGA-II method is utilized to solve the MOOP. The time-complexity of crowded tournament selection procedure in this case is equal to

a. $(m * n)$

b. $O\ (m^2\ * n)$

c. $O\ (m * n^2)$

d. $O\ (m * n * log(n))$

Correct Answer: d

Explanation: The detailed Solution is available in Week 7 Lecture 3 video material.

QUESTION 7: Which of the following is true for neural networks?

i) The error calculation which is followed in "Back-propagation algorithm" is the steepest descent method.

ii) Simulated annealing approach is followed in unsupervised learning.

iii) A problem whose output is linearly separable can also be solved with MLFFNN.

iv) The output of the perceptron with hard limit transfer function is more accurate than it is defined with any sigmoid transfer function.

a. i and iii are true
b. i and ii are true
c. ii and iv are true
d. all are true

Correct Answer: a

Explanation: The detailed description is given in Week 7 lecture material

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QUESTION 8: Which of the following MOEA algorithm is based on the concept of elitism?

a. MOGA
b. NPGA
c. NSGA
d. NSGA-II

Correct Answer: d
Explanation: The detailed explanation can be found out in week 7 lecture 2 video material.

QUESTION 9: Which of the following functions is known as the tan-sigmoid transfer function?

a. $\varphi(I) = \frac{1- e^{-\alpha l}}{1+ e^{-\alpha l}}$

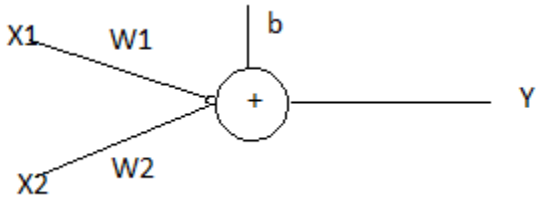
b. $\varphi(I) = \frac{1+ e^{-\alpha l}}{1- e^{-\alpha l}}$

c. $\varphi(I) = \frac{e^{\alpha l}- e^{-\alpha l}}{e^{\alpha l}+ e^{-\alpha l}}$

d. $\varphi(I) = \frac{e^{\alpha l}+ e^{-\alpha l}}{e^{\alpha l}- e^{-\alpha l}}$

Correct Answer: c
Explanation: From the definition of the tan-sigmoid function. The detailed description of the different thresholding functions is given in Week 7 lecture 4 video material.

QUESTION 10: A single layer feed forward neural network is used to represent the AND logic for two inputs as shown in the figure. Here, X1 and X2 are the inputs, W1 and W2 are the weights and b is the bias term. The summer block computes the summation of X1, X2 and b.



Which of the following weight and bias value-set is not valid for this AND implementation?

a. W1 = 0.5, W2 = 0.5, and b = -0.9

b. W1 = 1, W2 = 1, and b = -1.5

c. W1 = 2, W2 = 2, and b = -3

d. W1 = 0.5, W2 = 0.5, and b = -8

Correct Answer: d

Explanation: The detailed solution is given in Week 7 Lecture 5 video material in the section of the AND logic and it's neural network implementation.

**********END**********