Faculty of Computers and Information
Cairo University

Midterm Exam

Department: Computer Science
Course Name: Genetic Algorithms
Course Code: CS464
Examiner(s): Prof. Dr. Amr Badr

Date: 20/11/2016
Duration: 1 hours
Total Marks: 10

1- The correct representation of a problem is vital to its solution.
a- Taking the problem of function optimization, discuss the suitability of binary and floating point representations.
b- Calculate the number of bits necessary to represent a precision of 6 decimal places over a range of [1, 5].
[2 points]

2- a- Prove that any string of length m is an instance of 2^m different schemas.
b- Define the fitness f of bit string x with length m = 4, to be the integer represented by the binary number x. (eg. f(0011)=3, f(1111)=15). What is the average fitness of the schema **1* under f? What is the average fitness of schema *0** under f? .**[2 points]**

3-Given a stock market information system with governing variables x1, x2 and x3. It is required to infer the decision D. The following information is provided,

x1, x2, x3 range 0..100 with fuzzy sets L, M, H.

and D with decisions Sell:S and Buy: B and Hold:H

The following decision blocks apply,

DB1:

IF x1=L OR x2=L THEN y=L
IF x1=M AND x2=H THEN y=H
IF x1=H AND x2=M THEN y=M

DB2:

IF x3=L AND y=L THEN D=B
IF x3=M OR not y=H THEN D=S
IF x3 =H AND y=M THEN D=H

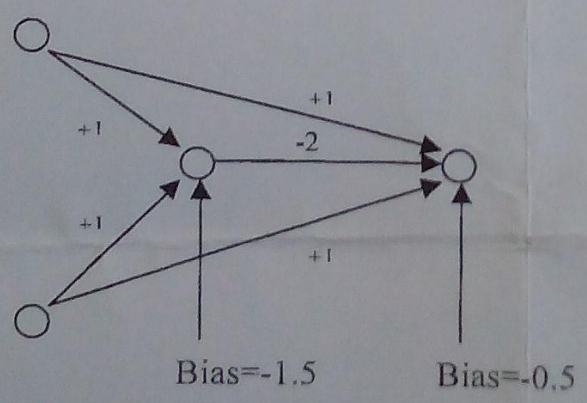
Intermediate variable y is

y range 0..100 with fuzzy sets VL, L, M, H, VH

determine the decision D for x1= 30, x2=70 and x3=30. .**[3 points]**

(3-)

4-Given the following neural network with weights and biases,



and applying the following activation function,

$$f(x) = \begin{cases} 1 & x > 0 \\ 0 & x \le 0 \end{cases}$$

Compute a truth table for the network. What function do you think this network emulates.**[3 points]**