

Florida International University
Department of Civil and Environmental Engineering

Homework 3

Optimization in Water Resources Engineering, Spring 2020

Instructor: Arturo S. Leon, Ph.D., P.E., D.WRE

1. (Adapted from Simonovic, 2017). Using the Genetic Algorithm (GA) method and the data given in Table 1, find the best fit analytical equation of the outflow vs. elevation curve. A typical empirical equation for the outflow vs. elevation curve is given by:

$$Q = AH^b$$

where:

Q = flow rate (m^3/s)

H = net head (m) above the invert of the outlet

A, b = constant parameters.

Note in Table 1 that the net head H is reservoir elevation minus 1660 m. The constant parameters A and b should be determined in such a way that the difference of the sum of squares between the analytic and tabulated values of flow for all ten points is minimized. Thus, this problem can be formulated as: find the values of parameters A and b such that the value of the following objective function is minimized:

$$\text{Min } \sum (Q_i - A(H_i - 1660)^b)^2$$

As part of your solution, include your GA code and the plot of the data fitting.

Table 1: Flow elevation data

Outflow (m^3/s)	Elevation (m)
0.000	1660.000
2.350	1661.225
3.678	1662.450
4.954	1663.675
6.029	1664.900
6.977	1666.125
7.834	1667.350
8.622	1668.575
9.355	1669.800
10.044	1671.025