Homework 2

BE/EE189 Design and Construction of Biodevices

Spring 2017

Due 19 Jan 2017

1. Create a VI that calculates the hyperfactorial of any positive integer n, where the hyperfactorial is equivalent to the value obtained by the operation

$$\prod_{k=1}^{n} k^k = 1^1 \cdot 2^2 \cdot 3^3 \cdots n^n. \tag{1}$$

   If the user inputs a value that is not a positive value, display a message informing the user that the input is not valid and request a new input. (It is better design to only allow unsigned integers as input, but part of the purpose of this exercise is to get you familiar with error clusters.) *Hint 1*: two important elements of the block diagram will be the One Button Dialog function and the Power of X subVI. *Hint 2*: If you run into the problem of infinite loop, first exit the loop by holding `Ctrl+.`. Use Event Structure to allow your program to run only once when there is a change in input value.

2. Create a subVI to compute the square root of a real number that is input by the user. Using case structures and error clusters, implement an error handling capability that displays the message `Square root of a negative number is not supported` anytime the user inputs a negative real number. The subVI should have as inputs `error in` and a real number, denoted by `y`, and as outputs it should have $\sqrt{y}$ (assuming y is nonnegative) and the `error out`. If the input is a negative number, set the output to the input. So if the input is `4`, the output is `2`, and the error cluster shows the status is `FALSE` (no error). If the input is `-4`, the output is `-4` and the error cluster shows the status is `TRUE` (an error occurred), the error code is `-1`, and the error message listed above appears. Save the VI as Square Root.vi and use it as a subVI in a new VI.

3. Construct a VI that calculates maximum heart rate using the following formulas:

Gender	Maximum Heart Rate
Male	$214 - \text{Age} \cdot 0.8$
Female	$209 - \text{Age} \cdot 0.7$

   Given the gender and age, use formula nodes to calculate the maximum heart rate.