Solution to the Exercise

The hypothesis to be tested as an extreme condition test for the test model is given as follows;
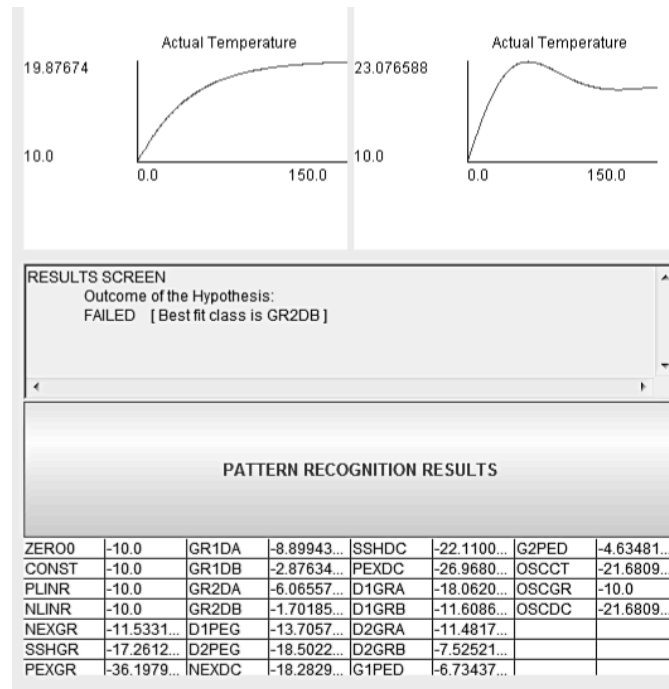
>*Hypothesis*: When *Desired Temperature* is higher than the initial value of the *Actual Temperature* variable, and the *Measurement Delay* is equal to *Adjustment Time*, the model is expected to demonstrate a negative exponential growth (converging to the *Desired Temperature*) behavior.

We specify this test in the SiS environment following the steps described in the Section 4.2 of the chapter (see Figure 1). When we run this second test, SiS reports a FAIL as expected. The resulting output from the test is given in Figure 2. As can be seen on the top right section of the screen, the Actual Temperature variable overshoots the desired temperature and then converges to it from above under the specified conditions. SiS classifies this behavior as an example of growth and decline type of behaviors (i.e. GR2DB) as can be seen in the dialog box. As this class does not match the hypothesized behavior class (i.e. NEXGR), the program evaluates the test as a failed one.

Figure 1. Setup of the experiment on SiS interface

Figure 2. Results of the hypothesis test on SiS interface

This is a deliberately selected test that is known to fail in order to demonstrate the response of SiS in such cases. The temperature adjustment system depicted in the test model is known to overshoot the desired temperature when the ratio of the measurement delay to the adjustment time is increased. The given model starts overshooting the desired temperature when the ratio of Adjustment Time to Measurement Delay is less than 4. The overshoot behavior becomes clearly visible as this ratio decreases further. As a result, both the observed model behavior and the test result generated by SiS are consistent with theoretical expectations.