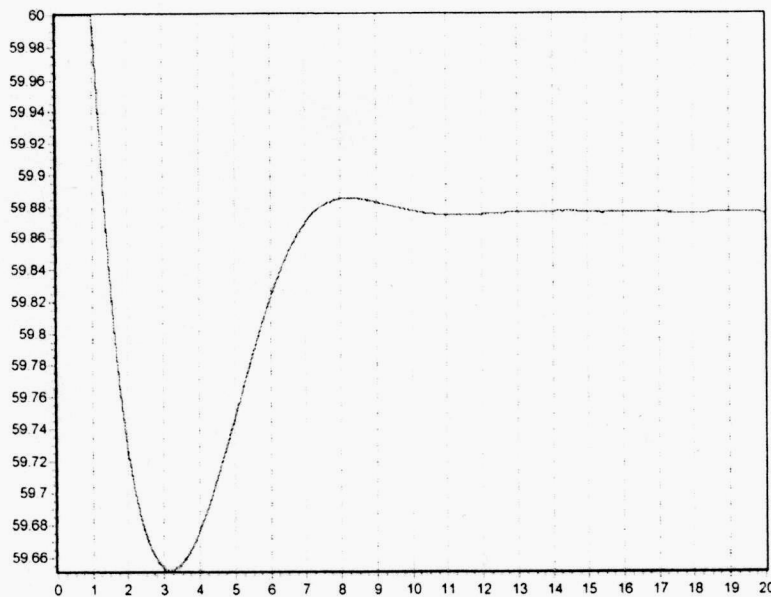


Homework 11 Solutions

- 12.3 System becomes unstable at about $K_a = 277$. Anything with $\pm$ about 10 of this answer should be considered correct.

- 12.11 Since all the R's are the same, the total β is just the sum of the on-line generators' MVA values (neglecting the contingency bus 50 unit) divided by $100 \text{ MVA} \cdot 0.05$ which gives $1035/(100 \cdot 0.05) = 207$ per unit. The expected change in frequency for the loss of 42.1 MW is $(-42.1/100)/207 = -0.00203$ per unit or -0.1218 Hz , which closely matches the actual (simulated) final frequency deviation of -0.124 Hz . The reason the simulated is larger because of a 0.5 MW increase in the system losses. With this loss changed included (i.e., a loss of 42.6 MW) the analytic value becomes -0.123 Hz . The plot of the bus frequency is given below, with the lowest frequency occurring at about 59.652 Hz at about 3.2 seconds.



- 14.15 The optimal solution space is rather flat around a value of 0.066 MW for total system losses. The below system solution represents an optimal (or near optimal) solution.

