## EECS20n, Quiz 3, 3/5/03

Please print your name and lab time here:

Last Name \_\_\_\_\_ First \_\_\_\_ Lab time \_\_\_\_\_

A single-input single-output system has the  $[A,b,c^T,d]$  representation given by

$$A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{bmatrix}, \quad b = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}, \quad c^T = [1 \ 0 \ 0], \quad d = 0.$$

1. Calculate  $A^n$ ,  $n \ge 0$ , by carrying out the matrix multiplications.

$$A^0 = \left[ \begin{array}{c} \\ \\ \end{array} \right], \ A = \left[ \begin{array}{c} \\ \\ \end{array} \right], \ A^2 = \left[ \begin{array}{c} \\ \\ \end{array} \right], \ A^3 = \left[ \begin{array}{c} \\ \\ \end{array} \right], \ A^n = \left[ \begin{array}{c} \\ \\ \end{array} \right], n \ge 3.$$

2. Recall that the impulse response is given by  $h: Naturals_0 \to Reals$ , in which  $h(0) = d, h(n) = c^T A^{n-1}b, n \ge 1$ . Find the impulse response for the system given above.

3. For the input  $x: Naturals_0 \to Reals$  given by x(1) = 1 and  $x(n) = 0, n \neq 1$ , find the zero-state response  $y: Naturals_0 \to Reals$ .