Digital Control – EEE 8007

Tutorial Exercise

You must a record with the solution and comments of ALL exercises.

1. Simulate the following system $\dot{\mathbf{X}}(t) = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} \mathbf{X}(t) + \begin{bmatrix} 1 \\ 0 \end{bmatrix} u \\ y(t) = \begin{bmatrix} 1 & 0 \end{bmatrix} \mathbf{X}(t) \Big\}$ using:

    a. One integrator.

    b. The state space block.

2. Find the discrete equivalent of the system (for T=0.1s).

3. Simulate the discrete system using:

    a. One delay block.

    b. The state space block.

4. Repeat questions 1-3 for $\mathbf{A} = \begin{bmatrix} -20 & -225 & -1250 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix}$, $\mathbf{B} = \begin{bmatrix} 1 & 0 & 0 \end{bmatrix}^T$,

    C=[0 0 1], **D**=**0**.

5. Similarly for the system : A=[-2 0;0 -1]; B=[2 1]'; C=[3 2]; D=0

6. Find the eigenvalues of the previous systems and check their controllability.

7. Use state feedback and DLQR controllers to improve their performance.