HW 4
EE 409 (Linear Systems), CSUF spring 2010
Spring 2010
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Contents

1 Problem 3.23 (a) 2

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1 Problem 3.23 (a)

Write the state variable equation for the following

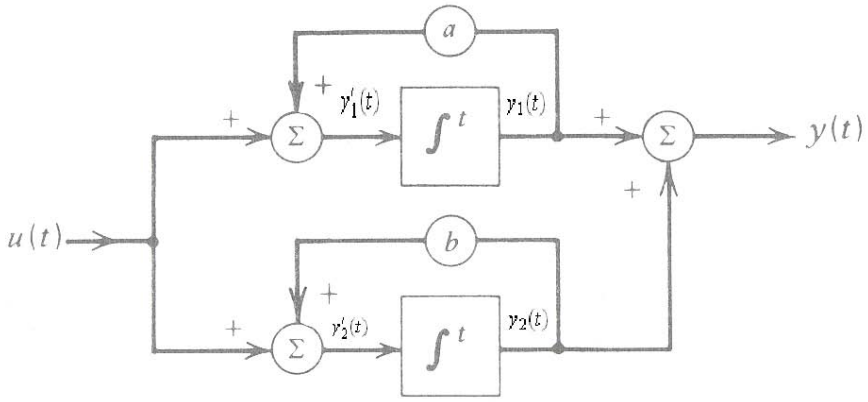

Figure 1: System description

Solution

Let $x_1(t)$ and $x_2(t)$ be the state variables. Hence from the diagram we see the following

$$x_1'(t) = ax_1(t) + u(t)$$
$$x_2'(t) = bx_2(t) + u(t)$$

And

$$y(t) = x_1(t) + x_2(t)$$

Hence

$$\begin{pmatrix} x_1'(t) \\ x_2'(t) \end{pmatrix} = \overbrace{\begin{pmatrix} a & 0 \\ 0 & b \end{pmatrix}}^{A} \begin{pmatrix} x_1(t) \\ x_2(t) \end{pmatrix} + \overbrace{\begin{pmatrix} 1 \\ 1 \end{pmatrix}}^{B} u(t)$$
$$y(t) = \overbrace{\begin{pmatrix} 1 & 1 \end{pmatrix}}^{C} \begin{pmatrix} x_1(t) \\ x_2(t) \end{pmatrix}$$