47. Zadatak

$$y'(t) + y(t) = u'(t) + 2u(t)$$

$$u(t) = 3\mu(t) \qquad y\left(0^-\right) = 9$$

1. Frekvencijska domena

$$y(t) \longleftrightarrow Y(s) \qquad y'(t) \longleftrightarrow sY(s) - y\left(0^-\right) = sY(s) - 9$$

$$u(t) \longleftrightarrow U(s) \qquad u'(t) \longleftrightarrow sU(s) - u\left(0^-\right) = sU(s)$$

$$Y(s)(s+1) - 9 = U(s)(s+2)$$

$$Y(s) = U(s)\frac{s+2}{s+1} + \frac{9}{s+1} \qquad U(s) = \frac{3}{s}$$

$$Y(s) = \frac{3s+6}{s(s+1)} + \frac{9}{s+1} = \frac{12s+6}{s(s+1)}$$

$$Y(s) = \frac{6}{s} + \frac{6}{s+1} \longleftrightarrow \left(6 + 6e^{-t}\right)\mu(t) = y(t)$$

2. Vremenska domena

$$y'(t) + y(t) = 3\delta(t) + 6\mu(t)$$

$$y'(t) + y(t) = 3u_1(t) + u_2(t)$$

$$u_1(t) = \delta(t) \qquad u_2(t) = 6\mu(t)$$

(1) Odziv na pobudu $u_1(t)$

$$y'(t) + y(t) = 3u(t) \qquad u(t) = \delta(t)$$

$$y'(t) + a_1 y(t) = b_0 u'(t) + b_1 u(t) \qquad \longrightarrow \qquad a_1 = 1 \qquad b_0 = 0 \qquad b_1 = 3$$

E da, zapravo tražimo impulsni odziv. Nja nja, po šabloni

$$h_A(t) = y_h(t) = Ce^{-t} \qquad h_A\left(0^+\right) = 1 \rightarrow C = 1$$

$$h_A(t) = e^{-t} \qquad h(t) = b_1 h_A(t) \rightarrow h(t) = 3e^{-t}$$

$$y_1(t) = h(t) = 3e^{-t}$$

(2) Odziv na pobudu $u_2(t)$

$$y'(t) + y(t) = u(t) \qquad u(t) = 6\mu(t)$$

Opće homogeno rješenje je

$$y_h(t) = Ce^{-t}$$

Partikularno rješenje je

$$y_p(t) = 6 \qquad t \geq 0$$

Totalni odziv je

$$y(t) = Ce^{-t} + 6 \qquad y\left(0^-\right) = y\left(0^+\right) = 9$$

$$C = 3 \rightarrow y_2(t) = 3e^{-t} + 6$$

(3) Odziv na linearnu kombinaciju pobuda $u_1(t)$ i $u_2(t)$

$$y(t) = y_1(t) + y_2(t)$$

$$y(t) = \left(6 + 6e^{-t}\right)\mu(t)$$

(4) Konačno

Bokić!!!