Problem 6 Exam 1

(a) $$y(t) + \frac{1}{7}\frac{d}{dt}y(t) = \frac{1}{7}x(t)$$

$$7y(t) + \frac{d}{dt}y(t) = x(t)$$

(c) $$7Y(j\omega) + j\omega Y(j\omega) = X(j\omega)$$

$$Y(j\omega)(7 + j\omega) = X(j\omega)$$

$$\frac{Y(j\omega)}{X(j\omega)} = H(j\omega) = \frac{1}{7+j\omega}$$

(b) $$H(j\omega) = \frac{1}{7+j\omega}$$

$$h(t) = e^{-7t}u(t)$$

(d) $$x(t) = e^{j7t}$$

$$X(j\omega) = 2\pi\delta(\omega - \omega_0)$$
$$= 2\pi\delta(\omega - 7)$$
} the signal is periodic

$$H(j\omega) = \frac{1}{7+j\omega}$$ } from part (c)

$$Y(j\omega) = X(j\omega)H(j\omega)$$

$$Y(j\omega) = \frac{2\pi\,\delta(\omega-7)}{7+j\omega}$$

Using,

$$x(t)\,\delta(t-t_0) = x(t_0)\,\delta(t-t_0)$$

$$y(t) = \frac{e^{j7t}}{7+j7}$$ Ans: