Birzeit University of Engineering and Technology
Electrical and Computer Engineering Department
EE2312 Signals &systems
Signals and Systems using Matlab-Assignment I

Inst.: Dr. Jamal Siam **1st sem-2023-24**

Question I:

Generate and plot the following signals using MATLAB:

1. $x(t) = u(t-1) - r(t-7) + r(-t+3)$
2. A finite pulse ($\pi(\frac{t}{6})$) with value = 3 centered at t=5
3. $x(t) = u(-t-4) + p(t)\pi(\frac{t-3}{6}) - r(t-7) + r(t-13)$ in the time interval [0 22]

Question II:

1. Generate and plot the signals $y_1(t) = sin(5\pi t)$, $y_2(t) = cos(10\pi t)$, $y_3(t) = sin(20\pi t)$ in the interval [0 3] seconds.
2. Plot the signals $m_1(t) = y_1 + y_2$, $m_2(t) = y_1 - y_2$, and $m_3(t) = y_2 \times y_3$, and $m_4(t) = y_3 \times y_3$
3. Determine, using the MATLAB plots, which of these signals is periodic (in case it is the case, determine the fundamental period), alternating, and has half-wave odd symmetry.

Question III:

Write Matlab scripts that determine the zero-state responses of the following systems by solving differential equations in the time domain.

1. $\frac{dy(t)}{dt} + 2y(t) = 15u(t)$
2. $\frac{d^2y(t)}{dt^2} + 3\frac{dy}{dt} + 2y(t) = 5\cos 200t$

Question IV:

Write Matlab scripts that determine the responses of the following systems by solving differential equations in the time domain. and the given initial conditions:

1. $\frac{dy(t)}{dt} + 2y(t) = 7u(t)$ $y(0) = 2;$
2. $\frac{d^2y(t)}{dt^2} + 2\frac{dy}{dt} + 4y(t) = 5\cos 200t$ (y (0) =1, y' (0) =2);

Question V:

Use Simulink (MATLAB) to simulate the following systems using the separate and integrate modeling, then show and plot the **step response** of the system.

1. $5\frac{d^5y(t)}{dt^5} + \frac{d^4y(t)}{dt^4} + 2\frac{d^3y(t)}{dt^3} + 6\frac{dy(t)}{dt} + 4y(t) = 3\frac{dx(t)}{dt} - 6x(t)$
2. $\frac{d^2y(t)}{dt^2} + 2\frac{dy}{dt} + 4y(t) = 5\,x(t)$

Question VI:

Write scripts to compute and plot the response of the following systems using convolution integral

- $h(t) = (10e^{-2t})\pi((t-5)/4)$ and $h(t) = \pi((t-1)/2)$

- $h(t) = (10e^{-2t})\pi((t-5)/4)$ and $h(t) = \pi((t-1)/2)$

Question VII:

Write a program that computes the Laplace transform of the function

3. $y(t) = (15 - 15e^{-0.25t})$u(t)
4. $y(t) = (20 - 8e^{-3t}\cos 100t)$u(t)

Question VIII:

Use Simulink (MATLAB) to simulate the following systems **in Laplace domain** then show and determine the transfer function of the system by using the Simulink model and Matlab commands.

$$6\frac{d^4y(t)}{dt^4} - 7\frac{d^2y(t)}{dt^2} + \frac{\mathrm{dy}}{\mathrm{dt}} + 9y(t) = \frac{d^3x(t)}{dt^3} + 5x(t)$$

Question IX:

Using Matlab commands determine the step and ramp responses of the system with the transfer function:

$$H(s) = 10000\frac{s+3}{s^2+6s+8}$$