

**Birzeit University-Faculty of Engineering and Technology**  
**Electrical and Computer Engineering Department**  
**EE2312 Signals & systems**  
**MATLAB \_Assignment**

Inst.: Dr. Jamal Siam Dr. Ashraf Al-Rimawi

2<sup>nd</sup> sem-2023

**Question I:**

Generate and plot the following signals using MATLAB:

1.  $X_1(t) = u(t-1) - u(t-7)$
2. A finite pulse ( $\pi(t)$ ) with value = 5 and extension between and center=8
3.  $X_2(t) = u(t-4) + r(t-7) - 2r(t-10) + r(t-13)$  in the time interval [0 20]

**Question II:**

1. Generate and plot the signals  $y_1(t) = \sin 200\pi t$ ,  $y_2(t) = \cos 750\pi t$ , then determine  $y_1$  and plot the signals  $m(t) = y_1 + y_2$  and  $n(t) = y_1 - y_2$
2. Determine, using the MATLAB plots, if the sum and/or difference signals are periodic. In case a signal is periodic, determine its fundamental frequency.)

**Question III:**

Write the programs that solve the following differential equations using zero initial conditions.

1.  $5 \frac{dy(t)}{dt} + 20y(t) = 15$
2.  $\frac{d^2y(t)}{dt^2} + 2 \frac{dy}{dt} + 4y(t) = 5 \cos 1000t$

**Question IV:**

Write the programs that determine the response of the linear time invariant system to the given input and the given initial conditions:

1.  $\frac{dy(t)}{dt} + 2y(t) = 7u(t) \quad y(0) = 2;$
2.  $\frac{d^2y(t)}{dt^2} + 4 \frac{dy}{dt} + 5y(t) = 5 \cos 2000t \quad (y(0) = 1, y'(0) = 2);$

**Question V:**

Use Simulink (MATLAB) to simulate the following systems then show and plot the step response of the system.

1.  $5 \frac{d^4y(t)}{dt^4} + 8 \frac{dy(t)}{dt} + 2y(t) = 4 \frac{d^2x(t)}{dt^2} - 12x(t)$
2.  $\frac{d^2y(t)}{dt^2} + 2 \frac{dy}{dt} + 4y(t) = 5x(t)$

**Question VI:**

Write a program that computes and plots the convolution of the functions

$$x(t) = (10e^{-6t})\pi((t-2)/4), \quad y(t) = (10e^{-6t} \cos 100t) \pi((t-6)/6)$$

**Question VII:**

Write a program that computes and plots the spectral representation of the function

1.  $y(t) = (10e^{-(3/2)t})u(t)$
2.  $y(t) = (10e^{-0.5t} \cos 300t)u(t)$

**Question VIII:**

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 IX:**

Use Simulink (MATLAB) to simulate the following systems **in Laplace domain** then show and plot the step response of the system.

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

**Question X:**

Write a program that determine the inverse Laplace transform of the transfer functions in IV.

**Question XII:**

Consider the transfer function:

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

- Compute the step response of the system.
- Plot the frequency response (semi-log scale) of the system with transfer function>