

**Birzeit University-Faculty Of Engineering**  
**Electrical Engineering Department**  
**Signals and Systems –EE2312**  
**MATLAB \_Assignment I**  
**2<sup>nd</sup> semester 2022**

**Question I:**

Generate and plot the following signals using MATLAB:

1.  $X_1(t) = u(t - 4) - u(t - 9)$
2. A finite pulse ( $\pi(t)$ ) with value = 4 and extension between 3 and 8
3.  $X_2(t) = u(t - 4) + r(t - 6) - 2r(t - 9) + r(t - 11)$  in the time interval [0 22]

**Question II:**

1. Generate and plot the signals  $y_1(t) \sin(200\pi t)$ , and  $y_2(t) = \cos(750\pi t)$ , then determine  $y_1$  and plot the signals  $m(t) = +y_2$  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.  $10 \frac{dy(t)}{dt} + 20y(t) = 10$
2.  $\frac{d^2y(t)}{dt^2} + 2 \frac{dy(t)}{dt} + 4y(t) = 5 \cos 1000t$

**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.  $\frac{dy(t)}{dt} + 5y(t) = 10u(t) \quad y(0) = 3;$
2.  $\frac{d^2y(t)}{dt^2} + 2 \frac{dy(t)}{dt} + 2y(t) = 5 \cos 2500t \quad (y(0) = 1, y'(0) = 2);$

**Question V:**

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

1.  $4 \frac{d^4y(t)}{dt^4} + 6 \frac{dy(t)}{dt} + 8y(t) = 7 \frac{d^2x(t)}{dt^2} + 12x(t)$
2.  $H(s) = \frac{100(s+3)}{(s+1)(s+4)} + \frac{10}{(s+10)}$  (Hint: transform to differential equation form)

**Question VI:**

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

1.  $y(t) = (10e^{-10t})u(t)$
2.  $y(t) = (10e^{-10t} \cos 100t)u(t)$

**Question VII:**

Write a program that computes the Laplace and Fourier transforms of the function and plot the phase and amplitude spectra.

3.  $y(t) = (10 - 10e^{-5t})u(t)$

4.  $y(t) = (30 - 10e^{-8t} \cos 100t)u(t)$

**Question VIII:**

Write a program that define the transfer functions and plots the zero-pole map of the systems

1. with poles (-1,-3) and zero (-6)
2. with poles (-1, 1+2j and 1-2j) and zero at (-3)

**Question IX:**

Write a program that determine the inverse Laplace and Fourier transforms of the transfer functions in VIII and plot their phase and magnitude spectra.