BIRZEIT UNIVERSITY

Faculty of Engineering & Technology
Electrical & Computer Engineering Department

ENEE2302

MatLab Assignment

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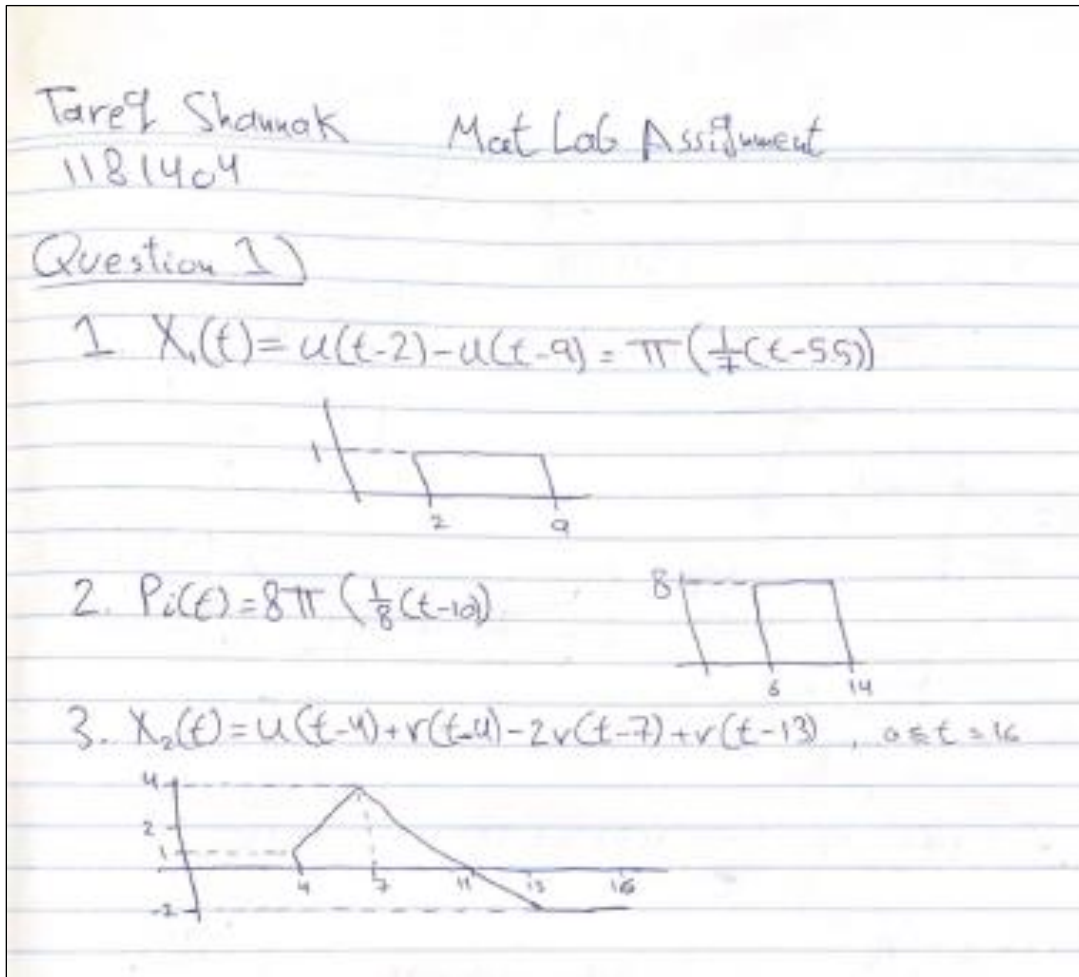
Section: 2

Date: 15/6/2020

Question 1
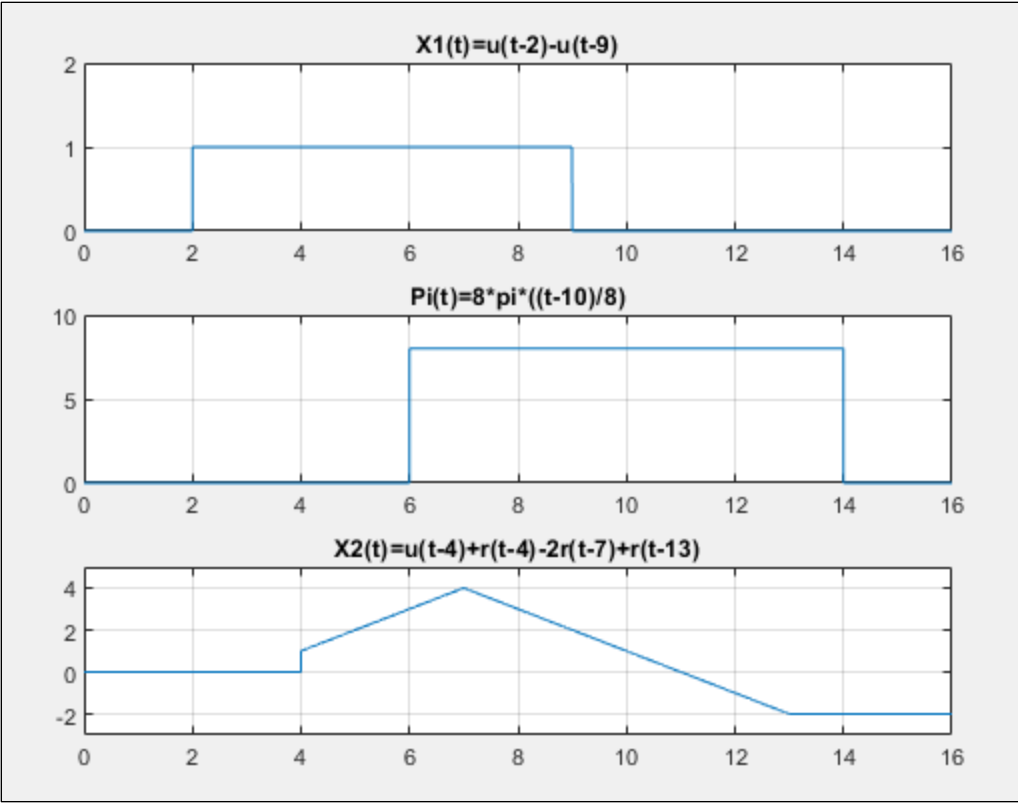
Generate and plot the following signals using MATLAB: 1.
$X_1(t) = u(t-2) - u(t-9)$

2. A finite pulse $(Pi(t))$ with value = 8 and extension
between 6 and 14

3. $X_2(t) = u(t-4) + r(t-4) - 2r(t-7) + r(t-13)$ in
the time interval [0 16]

Just Plotting like what we learned.

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Question 1)

1. $X_1(t) = u(t-2) - u(t-9) = \pi\left(\frac{1}{7}(t-5.5)\right)$

2. $P_i(t) = 8\pi\left(\frac{1}{8}(t-10)\right)$

3. $X_2(t) = u(t-4) + r(t-4) - 2r(t-7) + r(t-13)$, $0 \leq t \leq 16$

Question 2

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

$x(t) = (10e^{-0.5t}) \, \Pi(\frac{t-7}{4})$, and and $y(t) = (10te-0.5t)\Pi(\frac{t-12}{8})$

Question 2)

$x(t) = \left(10\,e^{-\frac{t}{2}}\right)\pi\left(\frac{1}{4}(t-7)\right)$

$y(t) = \left(10t\,e^{-t/2}\right)\pi\left(\frac{1}{8}(t-12)\right)$

$[5,9], [8,16] \Rightarrow [13,17,21,25]$

$t < 13 \int_{-\infty}^{\infty}$

$\int x(\tau)y(t-\tau)d\tau = 0$

$13 < t < 17$

$t-8 \int_{5}^{t-8} x(\tau)y(t-\tau)d\tau = \int_{5}^{t-8} 100(t-\tau)e^{\tau}d\tau$

$= +100t e^{\tau}\,e^{\tau}\Big|_{5}^{t-8} - 100e^{\tau}\frac{\tau^2}{2}\Big|_{5}^{t-8} = 100(t^2-13t)e^{t}-50e^{t}\,\tau^2\Big|_{5}^{t-8}$

$= 100(t^2-13t)e^{t} - 50e^{t}[t^2-16t+64-25]$

$= 100e^{t}(t^2-13t) - 50e^{t}(t^2-16t+39)$

$= 50e^{t}(2t^2-26t-t^2+16t-39)$

$= 50e^{t}(t^2-10t-39) = 50\,e^{t}(t+3)(t-13)$

IV

$17 < t < 21$

$$\int_{5*}^{9} X(\tau) Y(t-\tau) d\tau$$

$$= 100 e^t \left[t\tau \Big|_5^9 - \frac{\tau^2}{2} \Big|_5^9 \right]$$

$$= 100 e^t \left[4t - \frac{1}{2}(81 - 25) \right]$$

$$= 100 e^t [4t - 28]$$

$21 < t < 25$

$$\int_{t-16}^{9} X(\tau) Y(t-\tau) d\tau = 100 e^t \left[t\tau \Big|_{t-16}^{9} - \frac{\tau^2}{2} \Big|_{t-16}^{9} \right]$$

$$= 100 e^t \left[(25-t)t - \frac{1}{2}[81 - (t^2 - 32t + 256)] \right]$$

$$= 100 e^t \left[25t - t^2 - \frac{1}{2}[32t - t^2 - 175] \right]$$
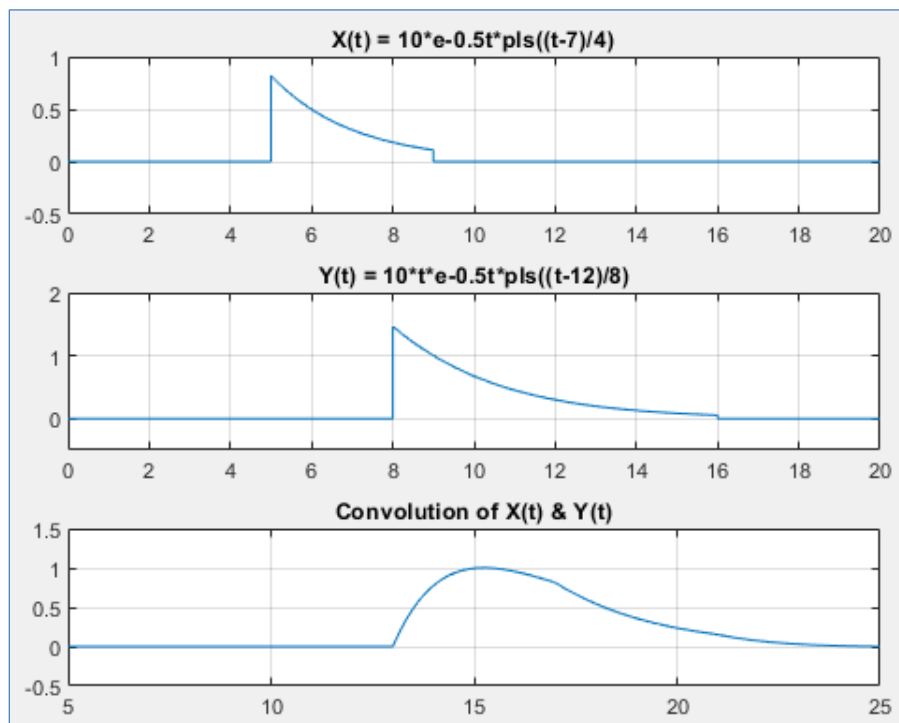
$$= 100 e^t \left[9t - \frac{1}{2} t^2 + \frac{175}{2} \right]$$

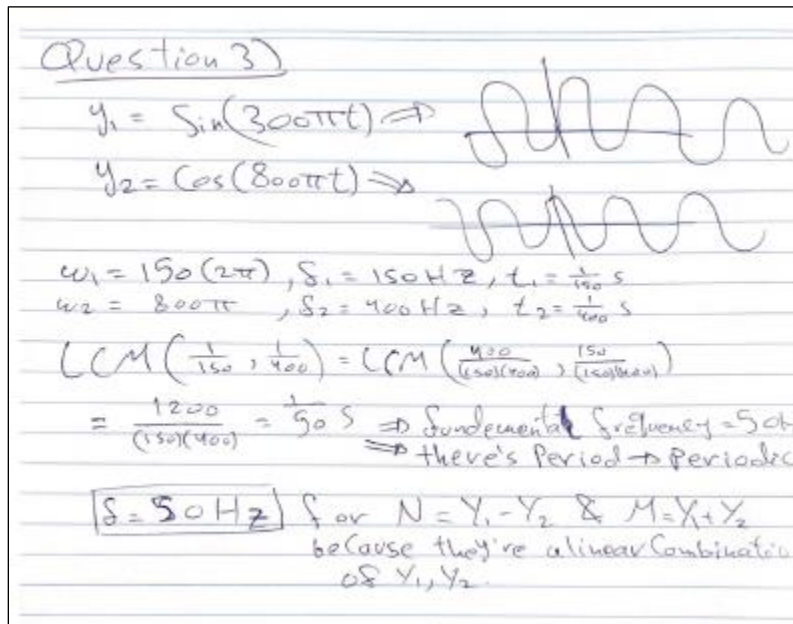$$= -50 e^t (t^2 - 18t - 175)$$

$t > 25$

$$\int_{-\infty}^{\infty} X(\tau) Y(t-\tau) d\tau = 0$$

These Calculations to show the convolution of two functions

V

Question 3

1. Generate and plot the signals $y_1(t) = sin(300\pi t)$, $y_2(t) = cos(800\pi t)$, then determine 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 generated signals are periodic. In case asignal is periodic, determine its fundamentalfrequency.

Question 3)

$y_1 = Sin(300\pi t) \Rightarrow$

$y_2 = Cos(800\pi t) \Rightarrow$

$\omega_1 = 150(2\pi)$, $S_1 = 150 Hz$, $t_1 = \frac{1}{150} s$

$\omega_2 = 800\pi$, $S_2 = 400 Hz$, $t_2 = \frac{1}{400} s$

$LCM\left(\frac{1}{150}, \frac{1}{400}\right) = LCM\left(\frac{400}{(150)(400)}, \frac{150}{(150)(400)}\right)$

$= \frac{1200}{(150)(400)} = \frac{1}{50} s \Rightarrow$ fundemental frequency $= 50 Hz$

$\Rightarrow$ there's Period $\rightarrow$ Periodic

$\boxed{S = 50 Hz}$ for $N = Y_1 - Y_2$ & $M = Y_1 + Y_2$

because they're a linear Combination of Y_1, Y_2.

The Signals are periodic and we can know their period from the plot and calculate the fundamental frequency