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CSC-453 Signals Processing Laboratory Assignment

Lab Assignment - 3:

**# Q 3. Basic Operations on signal**

import matplotlib.pyplot as plt

import numpy as np

t = np.arange(-5, 20, 0.2)

plt\_1 = plt.figure(figsize=(40/2, 30/2))

def x(a):

#x(t)

if (a >= 0 and a < 5):

tx = 1

elif(a >= 5 and a < 8):

tx = 2

elif(a >= 8 and a < 12):

tx = 5

else:

tx = 0

return tx

def y(a):

if (a >= 0 and a < 7):

ty = 2

elif(a >= 7 and a < 10):

ty = 0

elif(a >= 10 and a < 15):

ty = 7

else:

ty = 0

return ty

#X(t)

z = []

for i in t:

z.append(x(i))

plt.subplot(3, 4, 1)

plt.plot(t, z)

plt.xlim([min(t), max(t)])

plt.xlabel('Time (s)-->')

plt.ylabel('waveform-->')

plt.title('x(t)')

#Y(t)

z = []

for i in t:

z.append(y(i))

plt.subplot(3,4,2)

plt.plot(t,z)

plt.xlim([min(t), max(t)])

plt.xlabel('Time (s)-->')

plt.ylabel('waveform-->')

plt.title('y(t)')

#X(t)+Y(t)

z = []

for i in t:

z.append(x(i)+y(i))

plt.subplot(3,4,3)

plt.plot(t,z)

plt.xlim([min(t), max(t)])

plt.xlabel('Time (s)-->')

plt.ylabel('waveform-->')

plt.title('x(t)+y(t)')

#X(t)-Y(t)

z = []

for i in t:

z.append(x(i)-y(i))

plt.subplot(3,4,4)

plt.plot(t,z)

plt.xlim([min(t), max(t)])

plt.xlabel('Time (s)-->')

plt.ylabel('waveform-->')

plt.title('x(t)-y(t)')

# X\*Y Plot

z = []

for i in t:

z.append(x(i)\*y(i))

plt.subplot(3,4,5)

plt.plot(t,z)

plt.xlim([min(t), max(t)])

plt.xlabel('Time (s)-->')

plt.ylabel('waveform-->')

plt.title('x(t)\*y(t)')

# X/2+Y/3 Plot

z = []

for i in t:

z.append(x(i)/3 + y(i)/3)

plt.subplot(3,4,6)

plt.plot(t,z)

plt.xlim([min(t), max(t)])

plt.xlabel('Time (s)-->')

plt.ylabel('waveform-->')

plt.title('x(t)/2+y(t)/3')

# X(-t) plot

z = []

for i in t:

z.append(x(-i))

plt.subplot(3,4,7)

plt.plot(t,z)

plt.xlim([min(t), max(t)])

plt.xlabel('Time (s)-->')

plt.ylabel('waveform-->')

plt.title('x(-t)')

# Y(-t) plot

z = []

for i in t:

z.append(y(-i))

plt.subplot(3,4,8)

plt.plot(t,z)

plt.xlim([min(t), max(t)])

plt.xlabel('Time (s)-->')

plt.ylabel('Waveform-->')

plt.title('y(-t)')

# X(2t) plot

z = []

for i in t:

z.append(x(2\*i))

plt.subplot(3,4,9)

plt.plot(t,z)

plt.xlim([min(t), max(t)])

plt.xlabel('Time (s)-->')

plt.ylabel('Waveform-->')

plt.title('x(2t)')

# X(-2t+5) plot

z = []

for i in t:

z.append(x(-2\*i + 5))

plt.subplot(3,4,10)

plt.plot(t,z)

plt.xlim([min(t), max(t)])

plt.xlabel('Time (s)-->')

plt.ylabel('Waveform-->')

plt.title('x(-2t+5)')

# X(0.5t-5) plot

z = []

for i in t:

z.append(x(0.5\*i - 5))

plt.subplot(3,4,11)

plt.plot(t,z)

plt.xlim([min(t), max(t)])

plt.xlabel('Time (s)-->')

plt.ylabel('Waveform-->')

plt.title('x(0.5t-5)')

# X(-0.5t-5) plot

z = []

for i in t:

z.append(x(-0.5\*i - 5))

plt.subplot(3,4,12)

plt.plot(t,z)

plt.xlim([min(t), max(t)])

plt.xlabel('Time (s)-->')

plt.ylabel('Waveform-->')

plt.title('x(-0.5t-5)')

plt.subplots\_adjust(left = 1, # the left side of the subplots of the figure

right = 2, # the right side of the subplots of the figure

bottom = 1, # the bottom of the subplots of the figure

top = 2, # the top of the subplots of the figure

wspace = 0.9, # the amount of width reserved for blank space between subplots

hspace = 0.9) # the amount of height reserved for white space between subplots)

plt.show()

