

Department of Electrical and Computer Engineering
The University of Alabama in Huntsville
Spring 2021

CPE 381: Fundamentals of Signals and Systems for Computer Engineers

Due: Monday February 8 at 9:35 am

Please bring hardcopy to the class and upload softcopy to Canvas

Student name:

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1 10	2 15	3 20	4 10	4 15	5 30	Total

Homework #1

- (10 points) Write the formula and plot the roots of
 $z^7 + 1 = 0$
- (15 points) Represent the following complex numbers in alternative form (polar \leftrightarrow {Re,Im} $z=x+jy$)
 - $1 + j$
 - $1 - j$
 - $5 e^{j210^\circ}$
 - $5 e^{-j210^\circ}$
 - $z z^*$
- (20 points) Use Euler's identity to find trigonometric identities in terms of $\sin(\alpha)$, $\sin(\beta)$, $\cos(\alpha)$, and $\cos(\beta)$:
 - $\sin(\alpha + \beta)$
 - $\cos(\alpha + \beta)$Demonstrate all the steps in formula evaluation.
- (10 points) Write a script in Matlab to plot function

$$y(t) = Ae^{-t} \sin(2\pi ft), t \geq 0, \quad y(t) = 0 \text{ for } t < 0$$

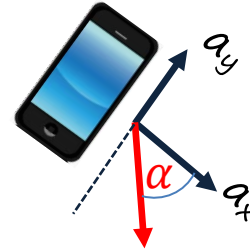
for $f = 2\text{Hz}$, $A = 2$, sampling frequency (F_s) of 20 Hz, and $-4 \leq t \leq 4$.

Plot the signal using blue line and envelope (positive and negative) of the signal using dotted red line.

- (15 points) Write a script in Matlab and plot the function $y(2 - \tau)$ where $y(t)$ is function from problem #4. Use Matlab arrays to manipulate samples from function in problem #4.

6. (30 points)

Accelerometer with analog output, sensitivity $\pm 2g$, and power supply of +3V is used in smartphone to determine orientation of the smartphone according to the figure below.



What are the values of X and Y components [in Volts] for the following positions



a)

X =

Y =



b)

X =

Y =



c)

X =

Y =



d)

X =

Y =

What is the angle of the smartphone if:

e) $X = 1.875 \text{ V}$, $Y = 0.8505 \text{ V}$ \rightarrow $\alpha =$

f) $X = 2.1495 \text{ V}$, $Y = 1.875 \text{ V}$ \rightarrow $\alpha =$

Please draw a phone as a part of the solution to avoid confusion.