Name:_____

Section:_____

EE322 Fall 2010 Exam 1: Part 2

- You will have the remainder of the lab period to take Part 2 of the exam.
- This portion of the exam is closed book/notes/calculators, but you are free to use MATLAB help as needed.

1. (10 pts) Calculations. Determine the following values **USING MATLAB**. Write the lines of code you used to find your answers.

   a. $\frac{1}{40e^{-2}}$ = 0.184726 `1/(40*exp(-2))`

   b. Magnitude of $23 - j15$ = 27.459060 `abs(23-j*15)`

      Phase (in degrees) of $23 - j15$ = -33.111342 degrees `angle(23-j*15)*180/pi`

   c. $\left(\sqrt{-1}\right)^{3.5}$ = 0.707107 + j-0.707107 `j^3.5`

   d. $\sum_{n=-21}^{21} n^3$ = 0.000000 (Note: n is an integer) `sum((-21:21).^3)`

   e. In a receiver, noise power can be calculated as $N = kTB$, where N is noise power in Watts, k is Boltzmann's constant (1.38×10^{-23} Joules/°K), T is the noise temperature in °K (Kelvin), and B is the receiver bandwidth in Hz). Find the noise power in Watts and dBW if noise temperature is 25°C and B = 15 MHz.

      Note: Degrees Kelvin is equal to degrees Celsius + 293. Note: $N_{dBW} = 10 \log_{10}(N)$.

      N = 6.5826e-014 Watts `N=1.38e-23 * (25+293) * 15e6` N_{dBW} = -131.816025 dBW `10*log10(N)`

(Turn this sheet over for Problem 2)

2. (20 pts) Programming.

a. Write a MATLAB function that will compute the value of the voltage signal given by $y = 3e^{-t/\tau} \cdot \cos^5(4.7\pi t + \tau)$. The function only computes the value, does NOT do any plotting. This function has two inputs, a scalar time constant τ, and time vector *t*. It also has one output. Call this function *myfunction*. You do not need to include comments.

What is the name of the file that you created for this function? _____*myfunction.m*_____

```
% Prob. 2a
function y = myfunction(tau, t)
y = 3*exp(-t/tau).*(cos(4.7*pi*t+tau)).^5;
```

b. Using your *myfunction* function, write a MATLAB program that will create a plot of two signals on the same plot for *t* = 0 to *t* =3.5 sec, at time intervals of 5 msec:

--Signal # 1: the values of this function with time constant τ = 2. This function should be a solid line on the plot.

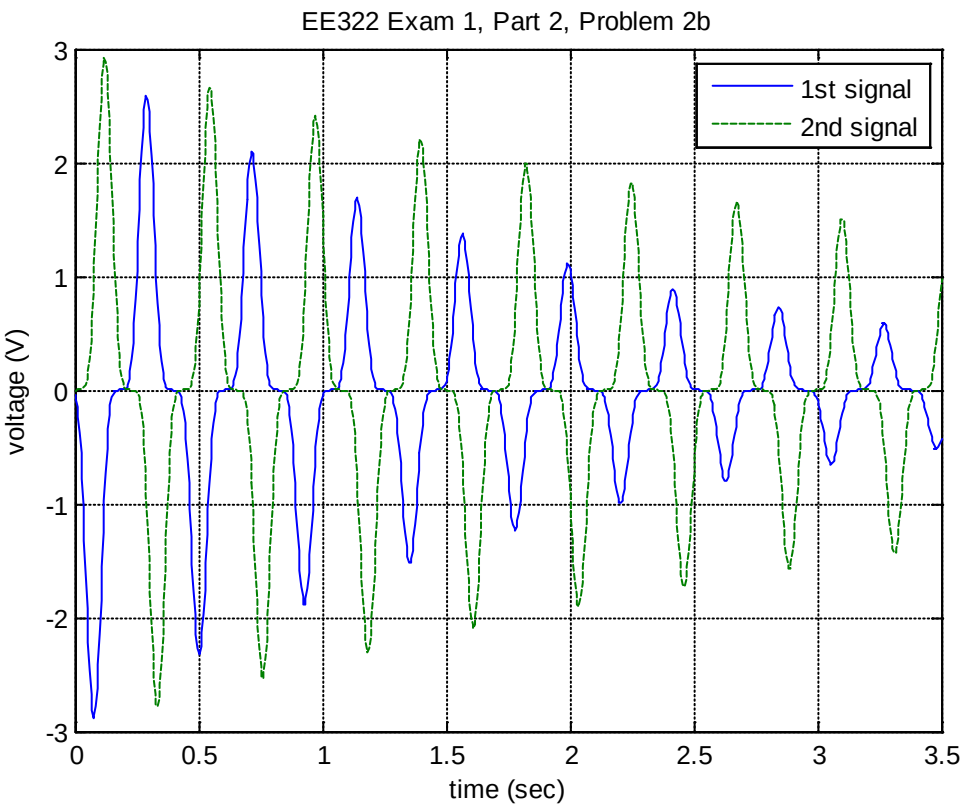
--Signal # 2: the values of this function with time constant τ = 4.5. This function should be a dashed line on the plot.

Properly label your plot, give it a legend, and give it a suitable title that includes your name.

Print out your code for the function (part a), the code for the plot (part b), and the figure. Be sure that your name is displayed somewhere on your printouts. Your name is important if multiple midshipmen are printing at the same time.

```
% Prob 2b

t=0:5e-3:3.5;
y1=myfunction(2,t);
y2=myfunction(4.5,t);
figure(1),plot(t,y1,t,y2,'--');
xlabel('time (sec)'),ylabel('voltage (V)')
title('EE322 Exam 1, Part 2, Problem 2b'),grid on
legend('1st signal','2nd signal')
```


EE322 Exam 1, Part 2, Problem 2b
1st signal
2nd signal
voltage (V)
time (sec)
3
2
1
0
-1
-2
-3
0
0.5
1
1.5
2
2.5
3
3.5