

American University of Beirut

Faculty of Engineering and Architecture

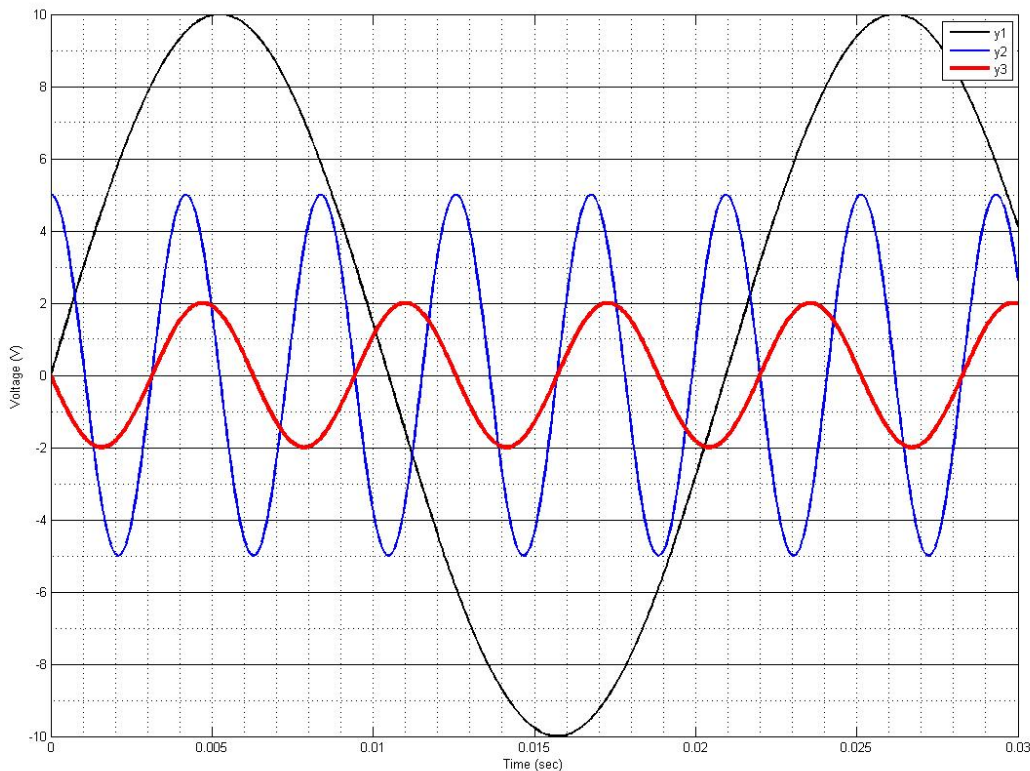
Department of Electrical and Computer Engineering

EECE200 – Introduction to Engineering– Fall 2011-2012

Homework 1

Problem 1 [30 points]

Answer the following questions for the plot below. The amplitude is in volts and the time is in seconds



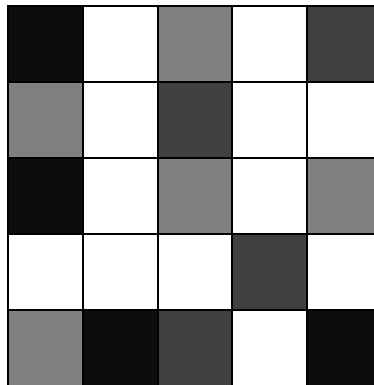
- Find the amplitude of y_1 , y_2 , and y_3 [3 points].
- Find the frequency, period, and angular frequency ω of each of the signals y_1 , y_2 , and y_3 . (Do not forget the units) [9 points].
- Which signal has the highest frequency [1 point]?
- If y_1 , y_2 , and y_3 can be written in the form of $y(t)=A \sin(\omega t+\theta)$, find the corresponding phase shift θ_1 , θ_2 , and θ_3 of the three signals in radians and then in degrees [12 points].
 - Show your analysis.

- Validate the calculated phases by finding the value of the signal at $t=0$
- e. Sketch the frequency domain of the above signals [5 points].

Problem 2 [10 points]

- Name one of the FM stations and state its frequency. Validate that it is within the FM dedicated bandwidth [3 points].
- How many stations can the AM dedicated bandwidth afford in Lebanon? Verify [3 points]
- Is the bandwidth of TV stations bigger than FM stations? Why? [2 points]
- Is the bandwidth of black and white TV station bigger than that of a color TV station? Why? [2 points]

Problem 3 [25 points]



- What are the dimensions of this image in pixels? [2 points]
- How many bits are needed to represent one pixel? Verify. Write the binary representation of each grey level [10 points].
- Show the matrix representation of this image. The matrix entries should be in decimal numbers. [8 points]
- If the image is part of a movie that is playing at a rate of 30 frames (pictures) per second; what would the size of the file be in mega bytes if I record on my computer 2.5 minutes of the movie? [5 points]

Problem 4 [35 points]

- Use the algorithm described in class to calculate the decimal equivalent of 10011101.011101_2 . Show all steps [9 points].
- Use the algorithm described in class to calculate the binary equivalent of 485.23_{10} . Show all steps in details [9 points].
- Convert 1574_8 from octal to binary representation. Show all steps. [4 points]
- Convert 100011111_2 from binary to hexadecimal representation. Show all steps. [4 points]
- Convert $1C8B_{16}$ from hexadecimal to decimal representation. Show all steps. [9 points]