ELEC50002: Communications Laboratory Assessment – 2024-25

The final assessment for the Communications Laboratory will be in the form of a lab oral. You will appear in the assessment with your lab partner (or in a group of 3).

Most of you are working in pairs. These pairs are made by dividing your tutorial groups. In some cases, there were only three students in a tutorial group. As I didn't want any students to work alone, I made groups of 3 students in those cases. If you have been assigned a lab partner who is not attending the lab (or your lab partner is on interruption of studies), please let me know as soon as possible. Then, I would group you with the other lab pair from your tutorial group to form a group of 3 students. The assessment will be a group assessment.

The purpose of the lab oral is to test your understanding of the experiment. You will be asked to explain selected topics from the experiments you perform in the laboratory. Each student might have to answer a different question.

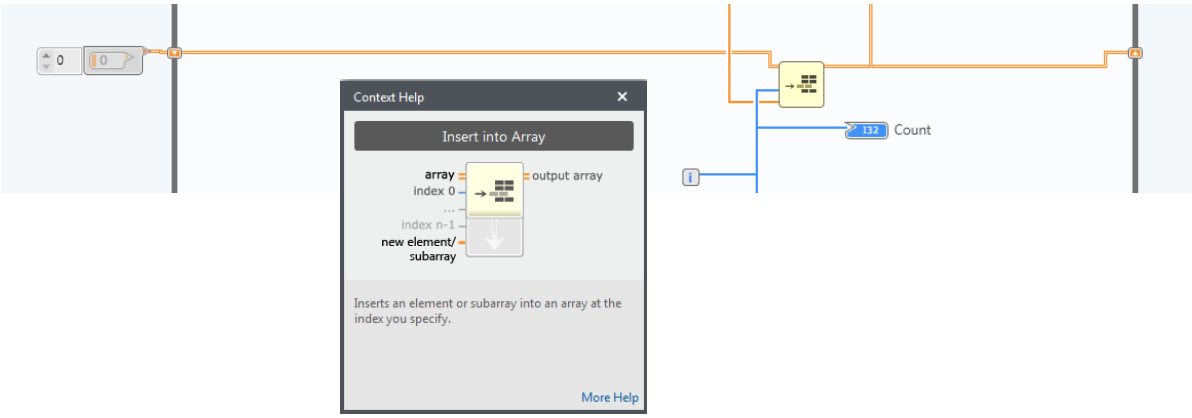
The details of the oral are given below:

- The duration of the oral is 20 mins.
- It will be conducted in a group.
- The oral will be conducted in the lab. If you have some MCs, you can request an online oral [your group members should agree with doing it online]
- You only need one logbook per lab pair/group.
- You will be given a group score for logbook and progress, but you will get an individual score for understanding.
- The marking rubric is given at the end.
- Some example questions are also given in this document.

Sample questions:

Lab 1

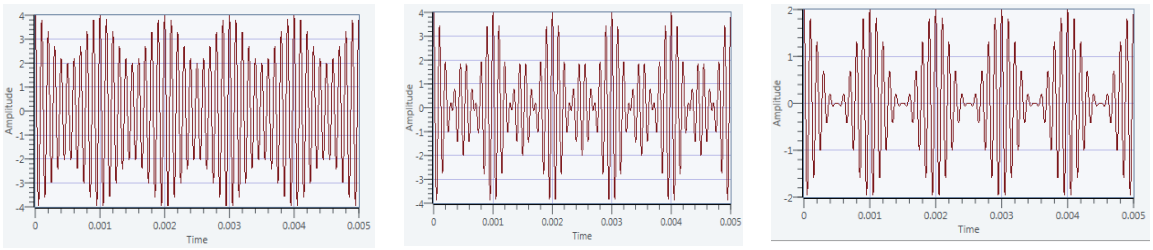
1. What is the following diagram performing:



2. What happens to the histogram of lab 1, exercise 2, if you change:
   a. the number of bins
   b. iterations
   c. dimensions of array
   d. wait time

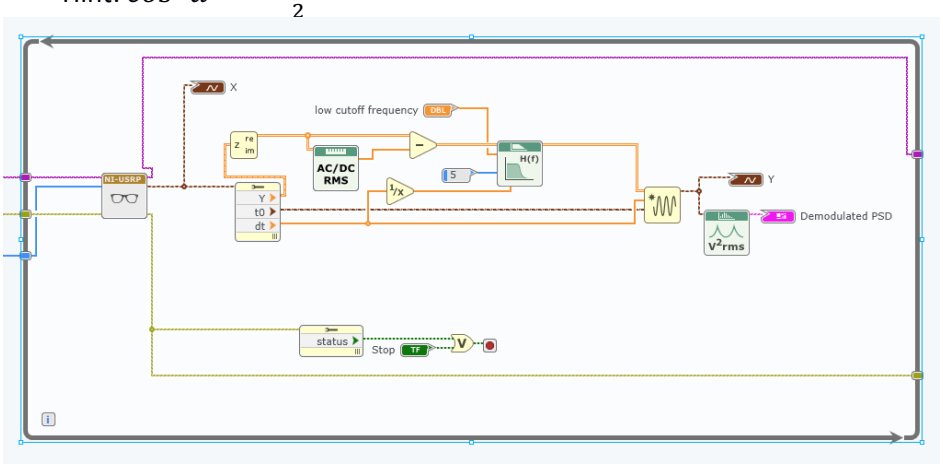
Lab 2

1. What is the impact of the modulation index on the shape of the AM signal? Can you identify the modulation index range in the following figures?



2. Suppose that the USRP's antenna received an AM signal defined as: $S(t) = [1 + \mu cos(2\pi f_m t)] * A_C cos(2\pi f_c t)$. What are the values obtained at the indicators X and Y?

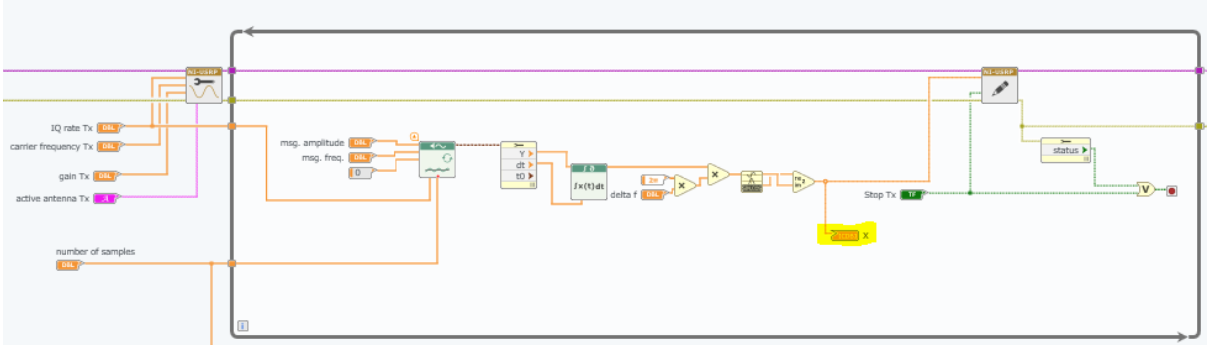
   Hint: $cos^2\alpha = \frac{1+cos2\alpha}{2}$



(AM receiver)

Lab 3

1. Describe (using equations) the operations used to create a signal in the code below. What is the signal obtained in the indicator X and what type of modulation does it represent?



Lab 4

1. What's the difference between BPSK and DPSK? Explain the advantages and drawbacks of both modulation techniques.

2. Given the following message bits:

0	**0**	**1**	**0**	**1**	**1**	**1**	**0**	**1**	**0**

Assuming we use DPSK modulation to transmit the above message bits and the channel introduces error in 3rd and 5th positions (marked in red). What are the DPSK encoded symbols? What are the decoded bits? Calculate the BER.

Marking Rubric

Category	40% – 50% (D)	50% – 60% (C)	60% – 70% (B)	70% – 100% (A)
Progress 30%	Poor progress made through the lab	Good progress made, covering most of the lab tasks	All lab tasks completed to a good standard	Everything completed well and some extension work attempted
Logbook Effectiveness 20%	Logbook is not well organised. Recorded information is of low quality.	Logbook is good, it covers the important information but not to great effect	Very good logbook, covers everything you would want it to and in some detail	Excellent logbook that covers all of the lab and more. Extra information taken from other sources
Understanding of the Circuits 50%	Struggle to answer questions in the easier sections	Answers basic questions well but lacks insight	Answering the more detailed questions well showing good insight	Able to tackle the more difficult questions that show thought outside the direct line of tasks in the lab.