Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (please print)

Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

ECE 2202 – Quiz #4A

October 29, 2019

Keep this quiz closed and face up until you are told to begin.

1. This quiz is closed book, closed notes. You may use one 8.5” x 11” crib sheet, or its equivalent.

2. Show all work on these pages. Show all work necessary to complete the problem. A solution without the appropriate work shown will receive no credit. A solution which is not given in a reasonable order will lose credit.

3. It is assumed that your work will begin on the same page as the problem statement. If you choose to begin your work on another page, you must indicate this on the page with the problem statement, with a clear indication of where the work can be found. **If your work continues on to another page, indicate clearly where your work can be found. Failure to indicate this clearly will result in a loss of credit.**

4. Show all units in solutions, intermediate results, and figures. Units in the quiz will be included between square brackets.

5. Do not use red ink. Do not use red pencil.

6. You will have 20 minutes to work on this quiz.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_/20

Room for extra work

For the equations below, the variables *a* and *b* are real variables. The variable *a* is an angle. For a complex quantity **E**, the quantity **E**\* is the complex conjugate of **E**. Find all possible solutions for the variables *a* and *b*. Show the steps you used to find your solution.



Room for extra work

Solution:

For the equations below, the variables *a* and *b* are real variables. The variable *a* is an angle. For a complex quantity **E**, the quantity **E**\* is the complex conjugate of **E**. Find all possible solutions for the variables *a* and *b*. Show the steps you used to find your solution.



**Solution:**

1. We apply algebra and a calculator to get  
   

We have taken complex conjugates of two of the expressions. Next, we multiply both sides by the denominator of the left hand side of the equation to get



Next, we choose to solve for a. We take the real part of both sides to get



Now, we can do some algebra to get



Our answers for a then are



Next, we can take the last complex equation above, and solve for b by taking the magnitude of both sides. We get  


We can square both sides to get



Solving, we get



We will find that one of the solutions for *a* is associated with one of the solutions for *b*, and the other two solutions are also connected.