

Peoplesoft ID Number: \_\_\_\_\_

## ECE 2202 – Exam 2 Problem 2

April 17, 2021

1. You may use one 8.5" x 11" crib sheet, or its equivalent. Do not communicate with anyone except Dr. Shattuck or Dr. Shan while you are taking this quiz.
2. Show all work necessary to complete the problem. Use additional sheets of paper as needed. A solution without the appropriate work shown will receive no credit. A solution which is not given in a reasonable order will lose credit. Include this page with your Peoplesoft ID Number, or include a different, separate page with your Peoplesoft ID Number. Failure to do this will result in points being deducted.
3. Show all units in solutions, intermediate results, and figures. Units in the quiz will be included between square brackets.
4. Do not use red ink. Do not use red pencil.
5. You will have 15 minutes to work on this problem, plus additional time to print, scan and email your work. Use a filename which is your Peoplesoft ID Number, followed by Problem2. Upload your completed problem to blackboard. It must be sent by 9:55 am, or points will be deducted.

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

2. An impedance  $Z = 15\angle 35^\circ[\Omega]$ .

- 1) Please write the rectangular form of  $Z$ .
- 2) Write the complex conjugate ( $Z^*$ ) of  $Z$  in rectangular and polar form.
- 3) Write  $-Z$  in rectangular and polar form.
- 4) Write  $\frac{1}{Z}$  in rectangular and polar form.
- 5) Calculate  $Z \cdot Z^*$ ;  $Z + Z^*$ ;  $\frac{Z}{Z^*}$ ; and  $Z \cdot j$ .

2. An impedance  $Z = 15 \angle 35^\circ [\Omega]$ .

- 1) Please write the rectangular form of  $Z$ .
- 2) Write the complex conjugate ( $Z^*$ ) of  $Z$  in rectangular and polar form.
- 3) Write  $-Z$  in rectangular and polar form.
- 4) Write  $\frac{1}{Z}$  in rectangular and polar form.
- 5) Calculate  $Z \cdot Z^*$ ;  $Z + Z^*$ ;  $\frac{Z}{Z^*}$ ; and  $Z \cdot j$ .

$$1) \cdot Z = 12.28 + 8.6j \text{ } [\Omega]$$

$$2) \cdot Z^* = 12.28 - 8.6j \text{ } [\Omega] = 15 \angle -35^\circ \text{ } [\Omega]$$

$$3) \cdot -Z = -12.28 - 8.6j \text{ } [\Omega] = -15 \angle 35^\circ \text{ } [\Omega]$$

$$4) \cdot \frac{1}{Z} = 0.055 - 0.038j \text{ } [\Omega] = \frac{1}{15 \angle 35^\circ} = \frac{1}{15} \angle -35^\circ \approx 0.066 \angle -35^\circ$$

$$5) \cdot Z \cdot Z^* = 15^2 = 225 \text{ } [\Omega^2]$$

$$Z + Z^* = 12.28 \times 2 = 24.56 \text{ } [\Omega]$$

$$\frac{Z}{Z^*} = \frac{15 \angle 35^\circ}{15 \angle -35^\circ} = 1 \angle 70^\circ = 0.342 + 0.939j$$

$$Z \cdot j = -8.6 + 12.28j \text{ } [\Omega]$$

