ECE 214 — Exam #1

Estimated time for completion: ≤ 1.25 hour 5 March 2019

Rules of the Exam

- Rule 1: The examination period begins at 11:00 am on Tuesday, 5 March 2019 and ends at 12:15 pm on Tuesday, 5 March 2019.
- Rule 2: The exam is worth 15 points.
- **Rule 3:** There are a total of 18 answers. Each answer is worth 1 point. The maximum score is 18 out of 15.
- **Rule 4:** The exam is closed book and closed notes. You may use your ECE 214 Laboratory Notebook, a ruler, and a calculator.
- Rule 5: To receive credit for an answer include the units along with the numerical answer.
- Rule 6: <u>Show all work</u> answers without supporting work will not receive credit.
- Rule 7: Do not leave the room until you have completed the exam.

Name

Problem 1: Consider the circuit shown below:



The input signal is given by:

$$V_{\rm IN}(t) = 8\cos(500t).$$
 (1)

The output signal is given by:

$$V_{OUT}(t) = A\cos(\omega t + \phi) + V_{DC}$$
⁽²⁾

- 1. What is *A*? _____
- 2. What is ω ? _____
- 3. What is ϕ ? _____
- 4. What is V_{DC} ? ______
- 5. When $V_{OUT}(t)$ is measured using an oscilloscope with a 1 M Ω input resistance, what is the measured value of A? ______
- 6. When $V_{OUT}(t)$ is measured using a DVM with a 3 M Ω input resistance and set to measure AC voltage, what voltage would the DVM read?





1. What type of filter is this?

- (a) Low pass filter
- (b) High pass filter
- (c) Band pass filter
- (d) Band reject filter
- (e) None of the above
- 2. What order filter is this?
 - (a) 1st order filter
 - (b) 2nd order filter
 - (c) 3rd order filter
 - (d) 4th order filter $% \left(d\right) =\left(d\right) \left(d$
 - (e) None of the above
- 3. What is the cut-off frequency? _____

When the input signal is a square wave	e with a period of $10 \mu s$, what
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4. is the magnitude of the 5th harmonic relative to the fundamental frequency at the output of the filter?

When the input signal is a square wave with a period of 10 ms, what 5. is the magnitude of the 5th harmonic relative to the fundamental

frequency at the output of the filter?

When the input signal is a square wave with a period of $100 \,\mu$ s, what 6. is the magnitude of the 5th harmonic relative to the fundamental frequency at the output of the filter?

Problem 3: For the OpAmp circuit shown below, calculate the voltages V_{out_1} and V_{out_2} for the given input voltages. The OpAmps are ideal.



\mathbf{V}_{in} (V)	\mathbf{V}_{out_1} (V)	\mathbf{V}_{out_2} (V)
3 + 200 t		
3		
3 - 200 t		

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Name: _____

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