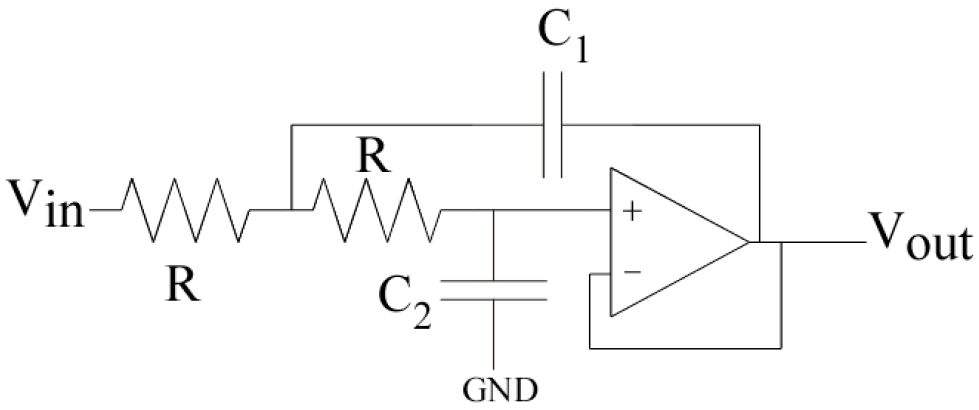
ECE 2040 Midterm Exam 3
Fall 2020

General Instructions instructions:

- Exam is closed book / closed notes other than the one-page of handwritten notes.
- Questions are worth 4 points unless otherwise stated.
- Only the final answers, as indicated by the question, will be considered correct for each question.
- Choose the best possible answer available in all cases.
- No taking the exam more than once. Two options are possible entirely to handle for Honorlock potential issues. Misuse of this opportunity will be considered cheating and result in a 0 for the exam.

Honorlock instructions:

- The only notes allowed are a one-page of handwritten notes plus the one page of notes from Exam 1 and 2. Front and back of the sheet are allowed. Sheet should be shown to the camera.
- Restroom breaks are not encouraged, although if necessary, it is allowed when asking the proctoring system. Timing will be recorded.
- Blank scratch paper is allowed, and needs to be shown to the proctor.
- Music is allowed assuming it is at a low volume and not conveying any exam answers.
- Individuals should be allowed to work using their scratch piece of paper (should not be a violation). The initial scan should include the space around the desk where the individual will be writing so there are no issues when writing on their scratch piece of paper.



This circuit is used for the next six questions.

1. What is the low-frequency gain for this circuit?
a. 0.25
b. 0.5
c. 1
d. 2
e. 4
f. 5
g. 8

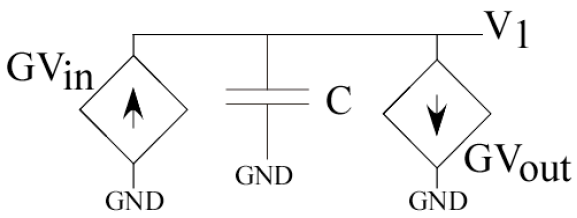
2. For C_1=40nF, C_2=10nF, R=50kΩ, what is the center timeconstant for this circuit?
a. 0.25ms
b. 0.5ms
c. 0.75ms
d. 1ms
e. 1.5ms
f. 2ms
g. 4ms

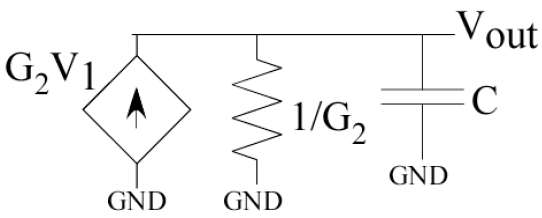
3. For C_1=40nF, C_2=10nF, R=50kΩ, what is the quality factor (Q) for this circuit?
a. 0.25
b. 0.33
c. 0.5
d. 1
e. 2
f. 3
g. 4

4. For C_1=80nF, C_2=5nF, R=50kΩ, what is the center timeconstant for this circuit?
a. 0.25ms
b. 0.5ms
c. 0.75ms
d. 1ms
e. 1.5ms
f. 2ms
g. 4ms

5. For C_1=80nF, C_2=5nF, R=50kΩ, what is the quality factor (Q) for this circuit?
a. 0.25
b. 0.33
c. 0.5
d. 1
e. 2
f. 3
g. 4

6. For C_1=80nF, C_2=5nF, R=50kΩ, what is gain at a 160Hz?
a. 0.5
b. 1
c. 2
d. 3
e. 4
f. 5
g. 6





This circuit is used for the next six questions.

7. For G = G_2 = 1/1MΩ, and C = 1pF, what is the low-frequency gain?
a. 0.25
b. 0.5
c. 1
d. 2
e. 4
f. 5
g. 8

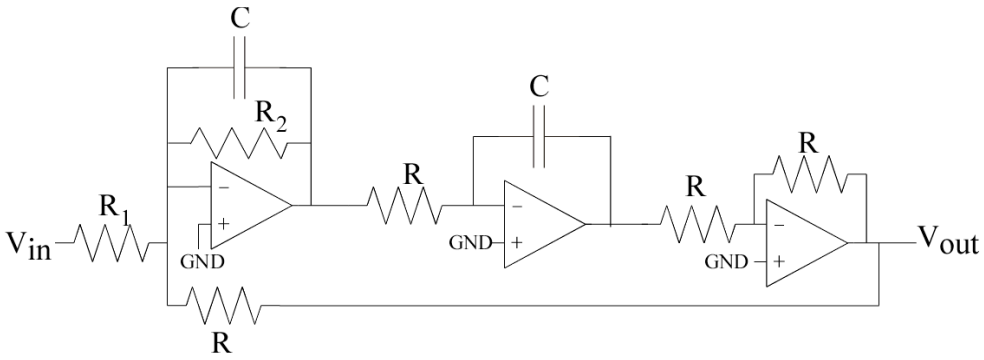
8. For G = G_2 = 1/1MΩ, and C = 1pF, what is the center timeconstant for this circuit?
a. 0.25µs
b. 0.5µs
c. 0.75µs
d. 1µs
e. 1.5µs
f. 2µs
g. 4µs

9. For G = 1/4MΩ, G_2 = 1/1MΩ, and C = 1pF, what is the center timeconstant for this circuit?
a. 0.25µs
b. 0.5µs
c. 0.75µs
d. 1µs
e. 1.5µs
f. 2µs
g. 4µs

10. For G = 1/4MΩ, G_2 = 1/1MΩ, and C = 1pF, what is the Quality factor (Q) for this circuit?
a. 0.25
b. 0.33
c. 0.5
d. 1
e. 2
f. 3
g. 4

11. For G_2 = 1/4MΩ, G = 1/1MΩ, and C = 1pF, what is the center timeconstant for this circuit?
a. 0.25µs
b. 0.5µs
c. 0.75µs
d. 1µs
e. 1.5µs
f. 2µs
g. 4µs

12. For G_2 = 1/4MΩ, G = 1/1MΩ, and C = 1pF, what is the Quality factor (Q) for this circuit?
a. 0.25
b. 0.33
c. 0.5
d. 1
e. 2
f. 3
g. 4



This circuit is used for the next six questions.

13. For R=10kΩ, R_1=5kΩ, R_2=30kΩ, C = 16pF, what is the center frequency for this circuit?
a. 10kHz
b. 30kHz
c. 100kHz
d. 300kHz
e. 1MHz
f. 3MHz
g. 10MHz

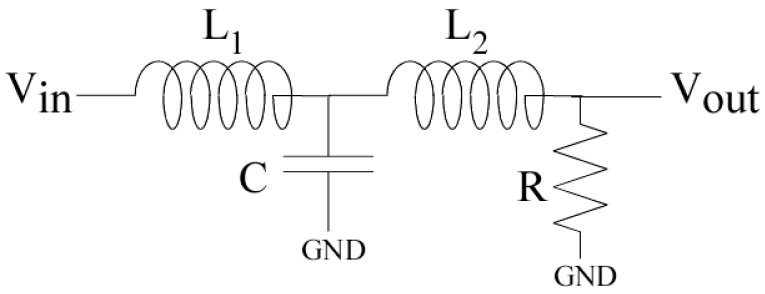
14. For R=10kΩ, R_1=5kΩ, R_2=30kΩ, C = 16pF, what is the low-frequency gain (magnitude) for this circuit?
a. 0.25
b. 0.5
c. 1
d. 2
e. 4
f. 5
g. 8

15. For R=10kΩ, R_1=5kΩ, R_2=30kΩ, C = 16pF, what is the quality factor (Q) for this circuit?
a. 0.25
b. 0.33
c. 0.5
d. 1
e. 2
f. 3
g. 4

16. For R=10kΩ, R_1=5kΩ, R_2=30kΩ, C = 16pF, what is the gain (magnitude) for an input frequency of 2MHz?
a. 0.25
b. 0.33
c. 0.5
d. 0.6
e. 1
f. 1.5
g. 2

17. For R=10kΩ, R_1=5kΩ, R_2=10kΩ, C = 16pF, what is the quality factor (Q) for this circuit?
a. 0.25
b. 0.33
c. 0.5
d. 1
e. 2
f. 3
g. 4

18. For R=10kΩ, R_1=5kΩ, R_2=100kΩ, C = 16pF, what is the quality factor (Q) for this circuit?
a. 0.1
b. 0.33
c. 1
d. 3
e. 10
f. 30
g. 300



This circuit is used for the next seven questions.

19. For R=1kΩ, L_1=0.24mH, L_2=0.08mH, C = 0.21nF, the cutoff frequency where the amplitude is roughly 0.7, would be
a. 100kHz
b. 300kHz
c. 1MHz
d. 3MHz
e. 10MHz
f. 30MHz
g. 100MHz

20. For R=1kΩ, L_1=0.24mH, L_2=0.08mH, C = 0.21nF, the gain at 100kHz is
a. 0.001
b. 0.01
c. 0.03
d. 0.1
e. 0.3
f. 0.7
g. 1

21. For R=1kΩ, L_1=0.24mH, L_2=0.08mH, C = 0.21nF, the gain at 1MHz is
a. 0.001
b. 0.01
c. 0.03
d. 0.1
e. 0.3
f. 0.7
g. 1

22. For R=1kΩ, L_1=0.24mH, L_2=0.08mH, C = 0.21nF, the gain at 10MHz is
a. 0.001
b. 0.01
c. 0.03
d. 0.1
e. 0.3
f. 0.7
g. 1

23. For R=1kΩ, L_1=0.24mH, L_2=0.08mH, C = 0.21nF, the phase at 400kHz is most closely near
a. 5degrees
b. 20degrees
c. 45degrees
d. 90degrees
e. 135degrees
f. 180degrees
g. 225degrees

24. For R=1kΩ, L_1=0.24mH, L_2=0.08mH, C = 0.21nF, what is the timeconstant associated with the real root of this system?
a. 100ns
b. 160ns
c. 300ns
d. 600ns
e. 1μs
f. 1.6μs
g. 6μs

25. For R=1kΩ, L_1=0.24mH, L_2=0.08mH, C = 0.21nF, what is the quality factor (Q) associated with the imaginary roots of this system?
a. 0.25
b. 0.33
c. 0.5
d. 1
e. 2
f. 3
g. 4