ECE 2040 Exam 3
Fall 2024

_____ / 100 Name _____

General Instructions:

- Exam is closed book / closed notes other than the one-page of handwritten notes.
- Blank scratch paper is allowed

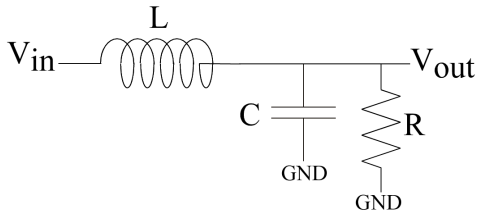
Each question is worth 3 1/3 (or 10/3) points. All questions are equally weighted.
All of your answers need to be on this sheet.
Only the final answers, as indicated by the question, will be considered correct for each question.

Choose the **best** possible answer available in **all** cases.

1. _____	11. _____	21. _____
2. _____	12. _____	22. _____
3. _____	13. _____	23. _____
4. _____	14. _____	24. _____
5. _____	15. _____	25. _____
6. _____	16. _____	26. _____
7. _____	17. _____	27. _____
8. _____	18. _____	28. _____
9. _____	19. _____	29. _____
10. _____	20. _____	30. _____

Choose the **best** possible answer available in **all** cases.

For the following circuit:



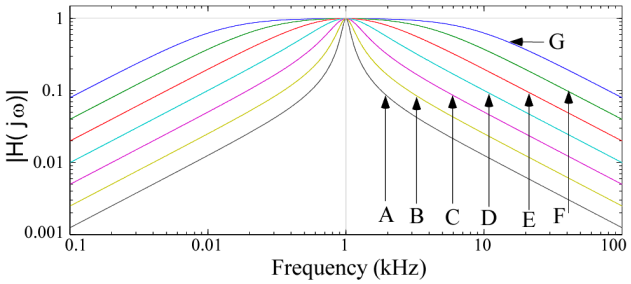
R = 1.25kΩ, C = 125nF, L =200mH

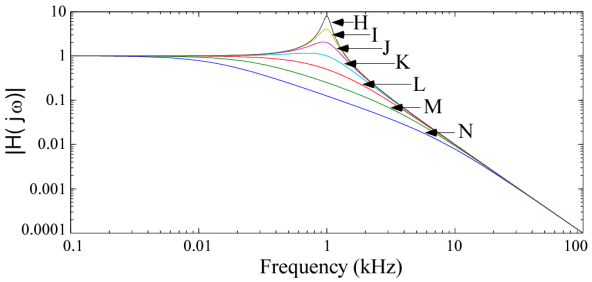
1. What is the center frequency of this circuit?
a. 0.5kHz
b. 1kHz
c. 2.5kHz
d. 6.5kHz
e. 10kHz
f. 15kHz
g. 20kHz

2. What is the Quality factor (Q) of this circuit?
a. 1/8
b. 1/4
c. 1/2
d. 1
e. 2
f. 4
g. 8

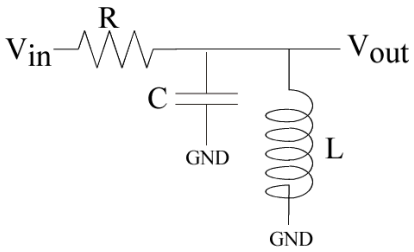
3. What type of filter is this circuit?
a. Lowpass
b. Bandpass
c. Highpass
d. Notch filter

Use the following responses for the following questions





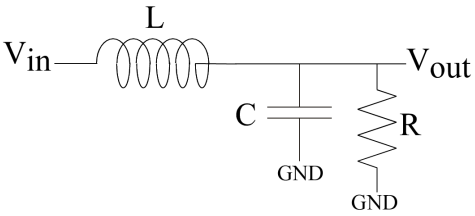
For the following circuit,



4. R = 5kΩ, C = 125nF, L =200mH

5. R = 156Ω, C = 125nF, L =200mH

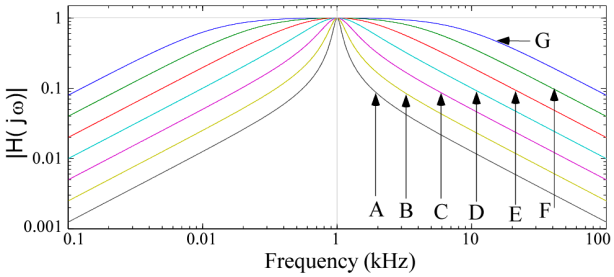
For the following circuit

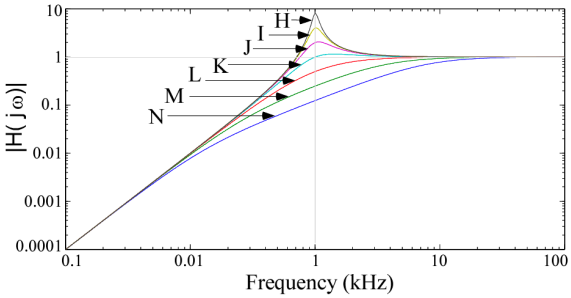


6. R = 2.5kΩ, C = 125nF, L =200mH

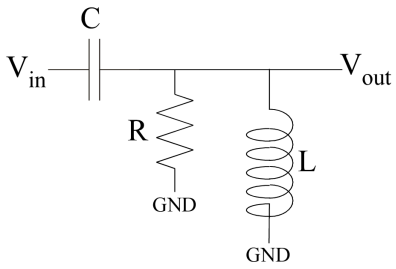
7. R = 310Ω, C = 125nF, L =200mH

Use the following responses for the following questions





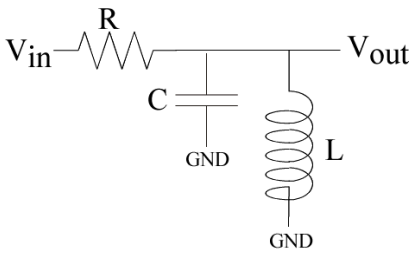
For the following circuit,



8. R = 2.5kΩ, C = 125nF, L =200mH

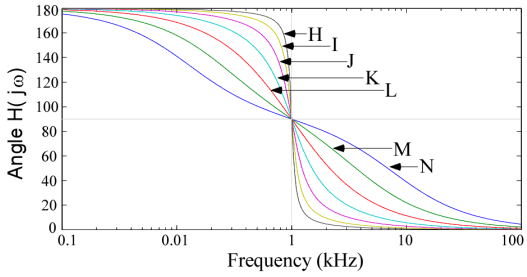
9. R = 5kΩ, C = 125nF, L =200mH

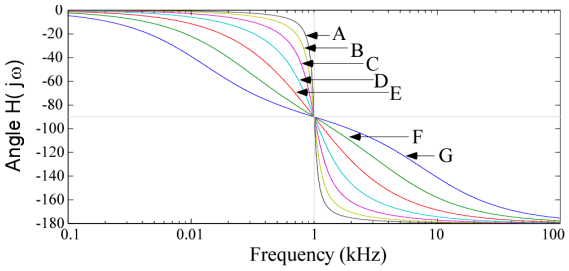
For the following circuit,



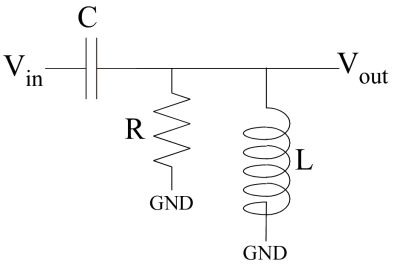
10. R = 1.25kΩ, C = 125nF, L =200mH

Use the following responses for the following questions



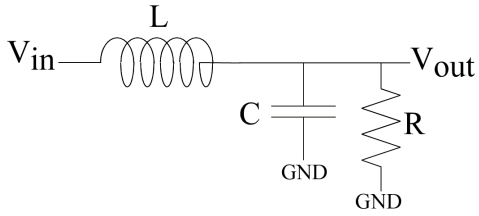


For the following circuit,



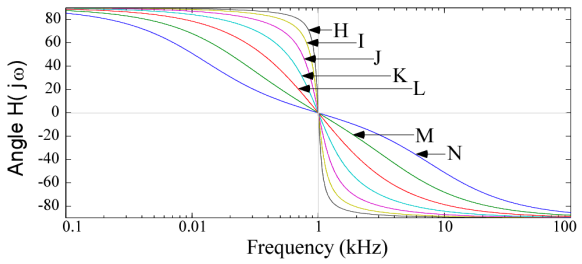
11. R = 156Ω, C = 125nF, L =200mH

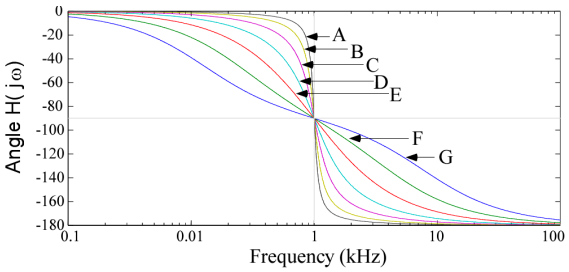
For the following circuit



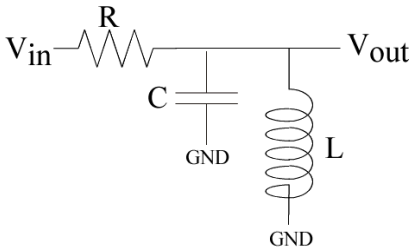
12. R = 156Ω, C = 125nF, L =200mH

Use the following responses for the following questions



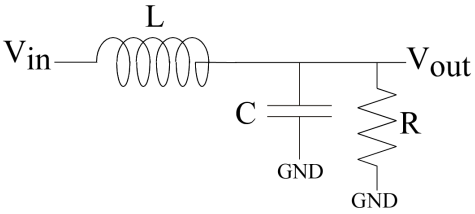


For the following circuit,



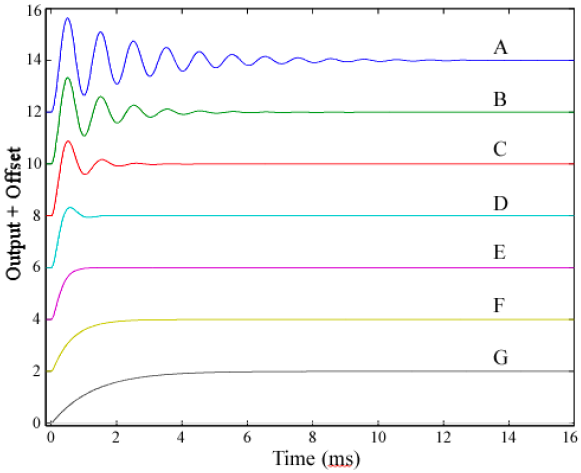
13. R = 10kΩ, C = 125nF, L =200mH

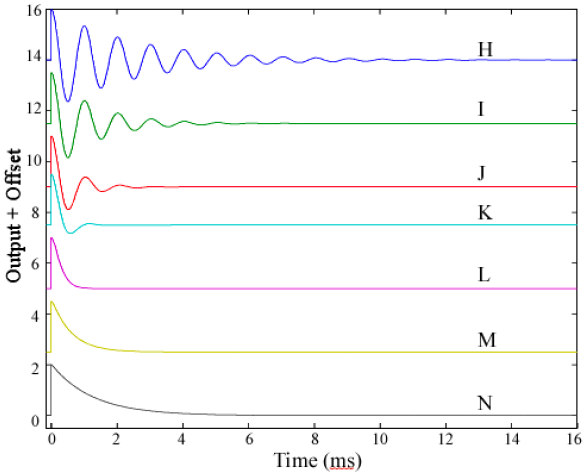
For the following circuit



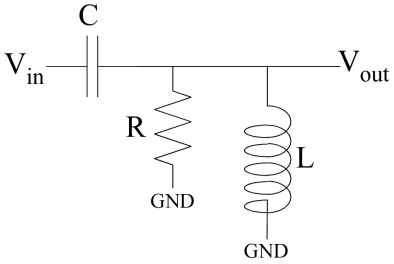
14. R = 10kΩ, C = 125nF, L =200mH

Which time responses below for a 2V input step (Input = 2V u(t), and different DC offsets are added to the output for visual clarity) correspond to the following circuits:





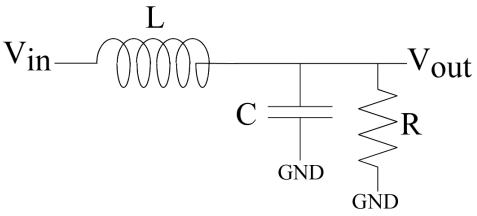
For the following circuit,



15. R = 625Ω, C = 125nF, L =200mH

16. R = 5kΩ, C = 125nF, L =200mH

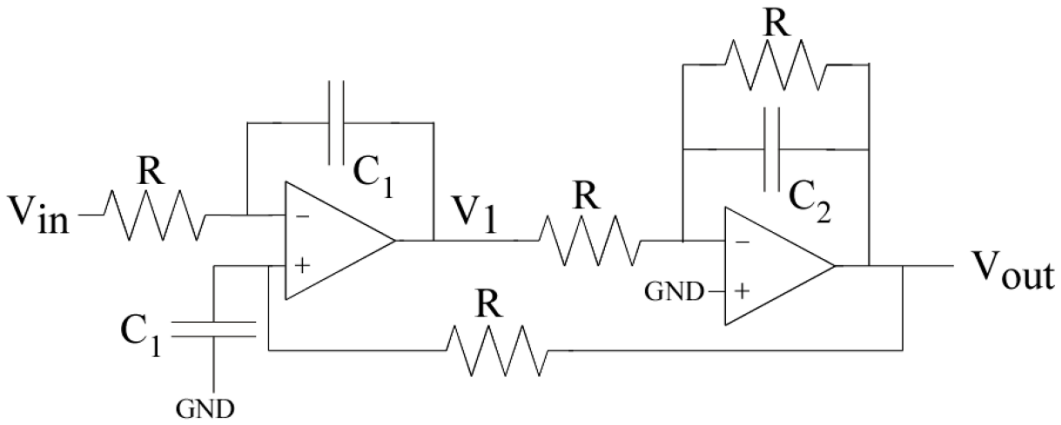
For the following circuit



17. R = 10kΩ, C = 125nF, L =200mH

18. R = 310Ω, C = 125nF, L =200mH

For the following circuit (Assume R = 160kΩ),



19. For $C_1 = C_2 = 1nF$, what is the center frequency?
a. 0.5kHz
b. 1kHz
c. 2kHz
d. 4kHz
e. 6kHz
f. 8kHz
g. 10kHz
h. 12kHz

20. For $C_1 = C_2 = 1nF$, what is the Quality Factor (Q)?
a. 0.125
b. 0.25
c. 0.5
d. 1
e. 2
f. 4
g. 8

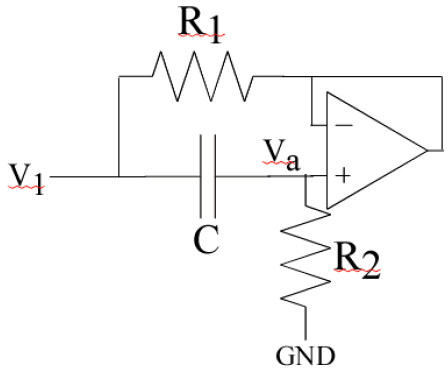
21. For $C_1 = C_2 = 1nF$, what is the low-frequency gain (magnitude)?
a. 8
b. 4
c. 2
d. 1
e. 0.5
f. 0.25
g. 0.125

22. For $C_1 = 0.125nF$ & $C_2 = 8nF$, what is the center frequency?
a. 0.5kHz
b. 1kHz
c. 2kHz
d. 4kHz
e. 6kHz
f. 8kHz
g. 10kHz
h. 12kHz

23. For $C_1 = 0.125nF$ & $C_2 = 8nF$, what is the Quality Factor (Q)?
a. 0.125
b. 0.25
c. 0.5
d. 1
e. 2
f. 4
g. 8

24. For $C_1 = 0.125nF$ & $C_2 = 8nF$, what is the Gain (magnitude) at 1kHz?
a. 0.125
b. 0.25
c. 0.5
d. 1
e. 2
f. 4
g. 8

For the following circuit, what is the closest input resistance (magnitude), the effective resistance looking into V_1 terminal (the Thevenin—Norton resistance),



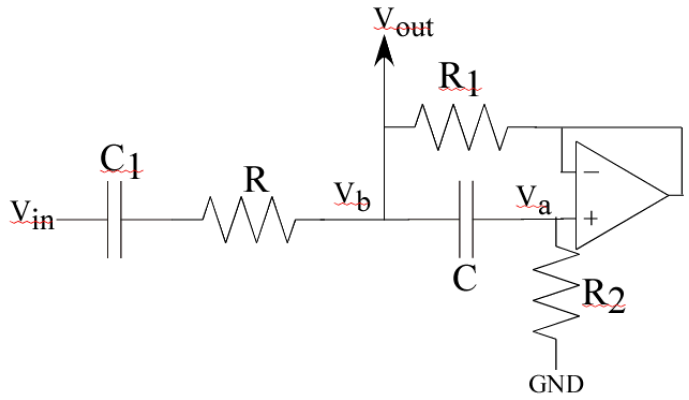
a. 50Ω
b. 100Ω
c. 200Ω
d. 300Ω
e. 600Ω
f. 1kΩ
g. 2kΩ
h. 5kΩ

$R_1 = 100\Omega$, $R_2 = 1M\Omega$, $C = 1nF$

25. At 100Hz

26. At 1kHz

For the following circuit,



R = 625Ω, R_1 = 100Ω, R_2 = 1MΩ, C = 1nF, C_1 = 2.5nF

27. Is this circuit from input (V_{in}) to output (V_{out}) between 1Hz and 1MHz a/an
a. Low-pass filter
b. Notch filter
c. Bandpass filter
d. High-pass filter
e. All-pass filter

28. What is the magnitude of the gain (V_{out} / V_{in}) at 10kHz?
a. 0.01
b. 0.03
c. 0.1
d. 0.3
e. 1
f. 3
g. 10

29. What is the magnitude of the gain (V_{out} / V_{in}) at 100Hz?
a. 0.01
b. 0.03
c. 0.1
d. 0.3
e. 1
f. 3
g. 10

30. For this second-order circuit, what is the Quality factor of the transfer function?
a. 0.01
b. 0.03
c. 0.1
d. 0.3
e. 1
f. 3
g. 10