Name ________________ Grade = /100

(1 point)

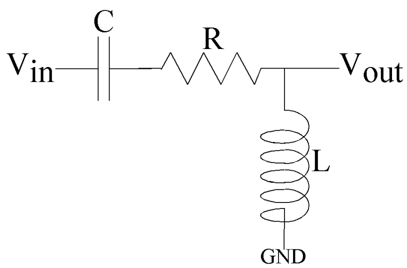
ECE 2040 Midterm Exam 3
Spring 2019

Each question is worth 3 points.
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.
You will only turn in this single sheet. You can take the rest of the exam with you. We will not keep the rest of the exam materials if you leave them.

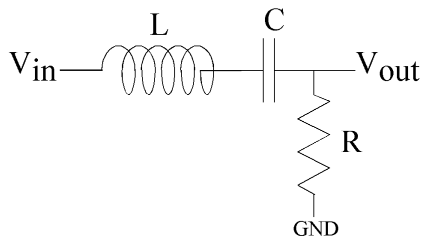
Choose the *best possible answer* available in all cases.

1. ________	12. ________	23. ________
2. ________	13. ________	24. ________
3. ________	14. ________	25. ________
4. ________	15. ________	26. ________
5. ________	16. ________	27. ________
6. ________	17. ________	28. ________
7. ________	18. ________	29. ________
8. ________	19. ________	30. ________
9. ________	20. ________	31. ________
10. ________	21. ________	32. ________
11. ________	22. ________	33. ________

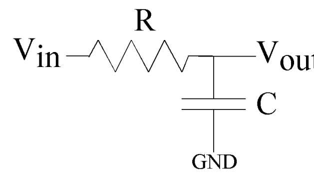
Which of the following circuits,



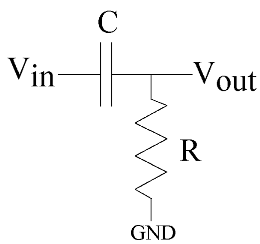
(a)



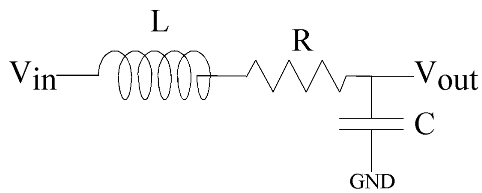
(b)



(c)



(d)



(e)

could produce the following transfer functions. Choose the best answers in all cases.

Question #1: $$H(s) = \frac{s\tau}{1 + s\tau}$$

Question #2: $$H(s) = \frac{\tau s}{1 + s\tau/Q + s^2\tau^2}$$

Question #3: $$H(s) = \frac{\tau^2 s^2}{1 + s\tau/Q + s^2\tau^2}$$

Question #4: $$H(s) = \frac{1}{1 + s\tau/Q + s^2\tau^2}$$

Question #5: $$H(s) = \frac{1}{1 + s\tau}$$

Using the circuits above, identify the type of filtering function each produces. Choose the best answer in all cases.

Question #6: Second-Order High-Pass Filter

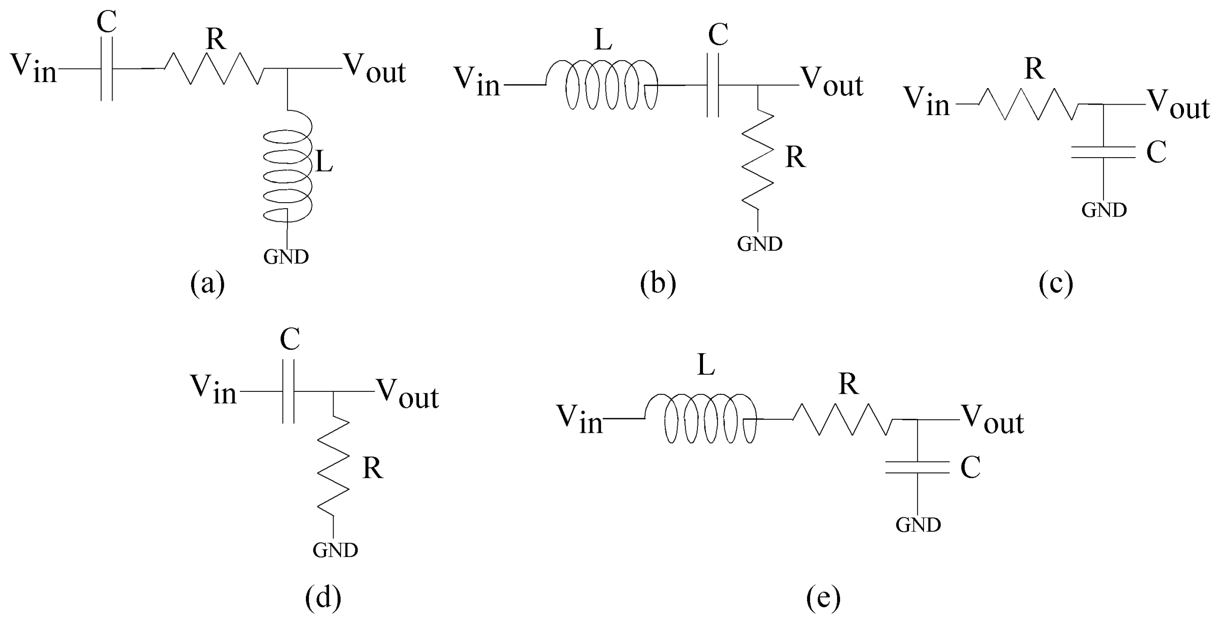
Question #7: First-Order Low-Pass Filter

Question #8: Bandpass Filter (Second-Order Filter)

Question #9: Second-Order Low-Pass Filter

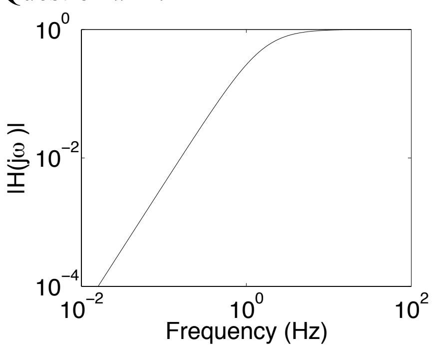
Question #10: First-Order High-Pass Filter

Which of the following circuits,

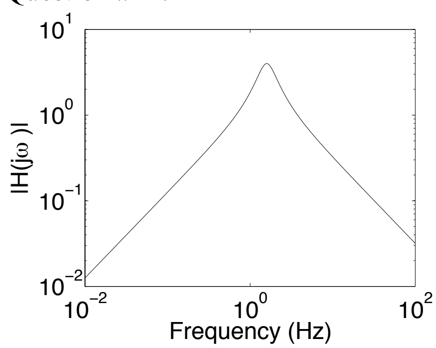


could produce the following frequency magnitude responses.   Choose the best answers in all cases.

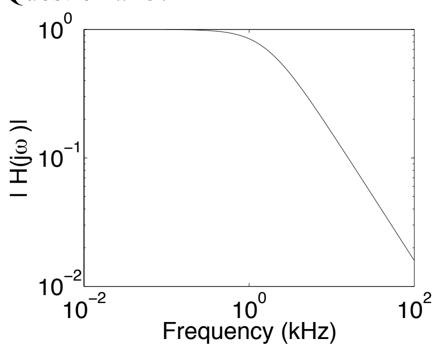
Question #11:



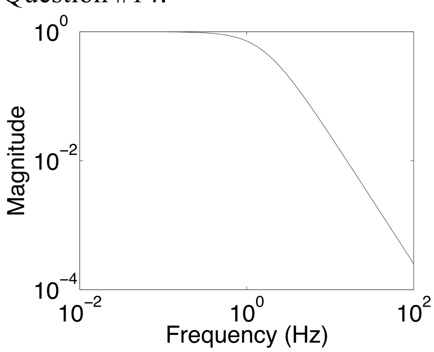
Question #12:



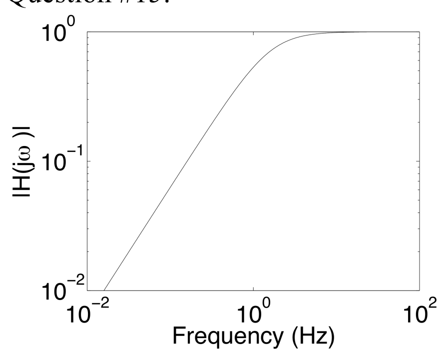
Question #13:



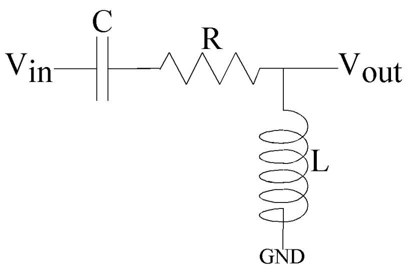
Question #14:



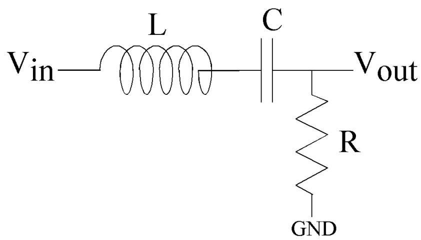
Question #15:



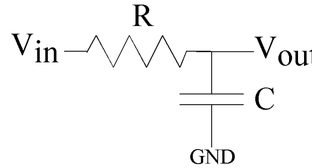
Which of the following circuits,



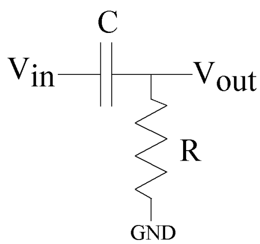
(a)



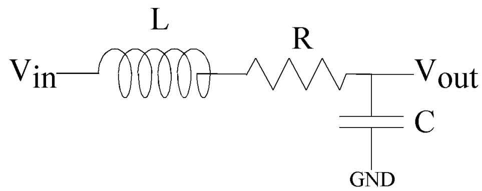
(b)



(c)



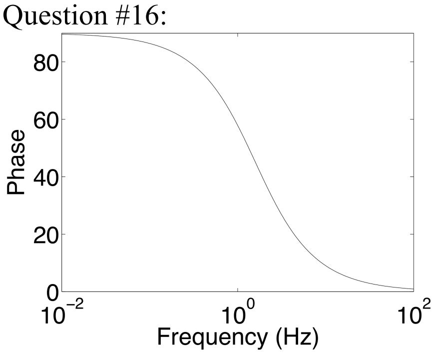
(d)



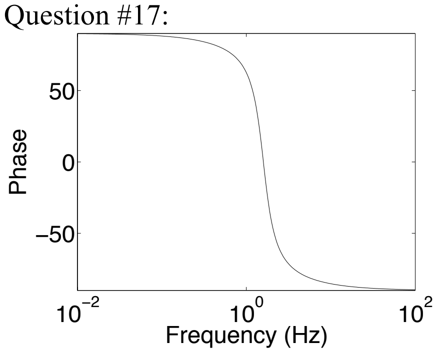
(e)

could produce the following frequency phase responses. Choose the best answers in all cases.

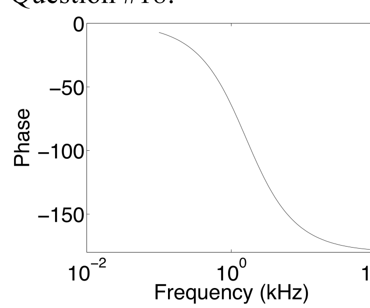
Question #16:



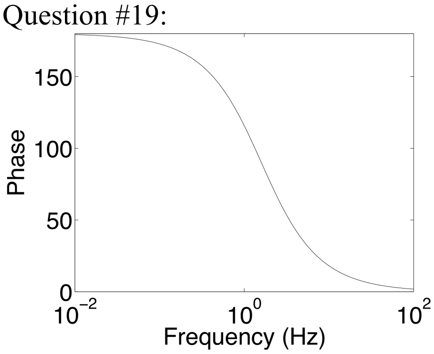
Question #17:



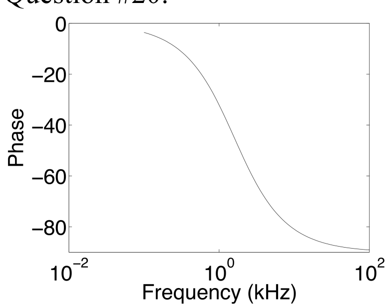
Question #18:



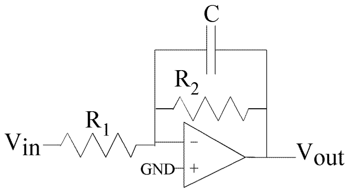
Question #19:



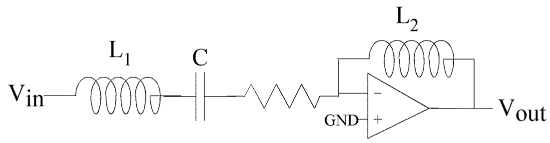
Question #20:



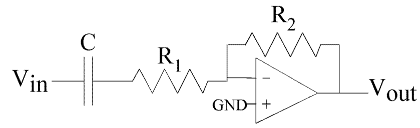
Which of the following circuits,



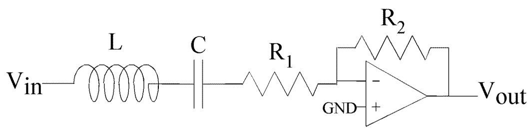
(a)



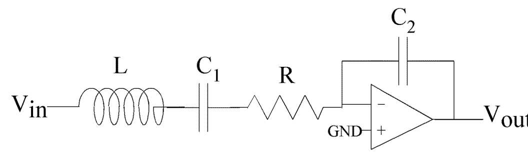
(b)



(c)



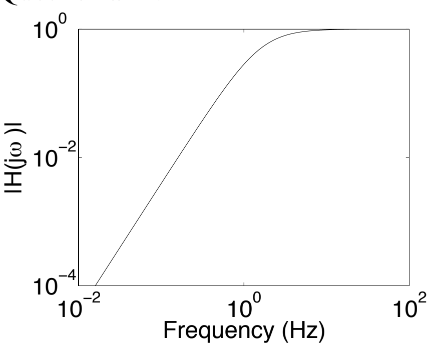
(d)



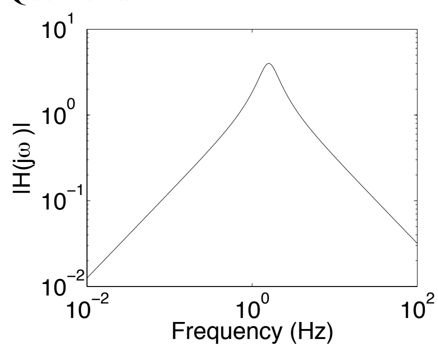
(e)

could produce the following frequency magnitude responses.   Choose the best answers in all cases.

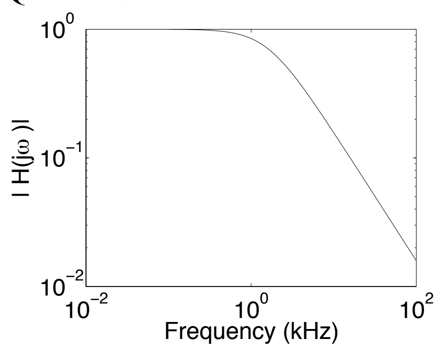
Question #21:



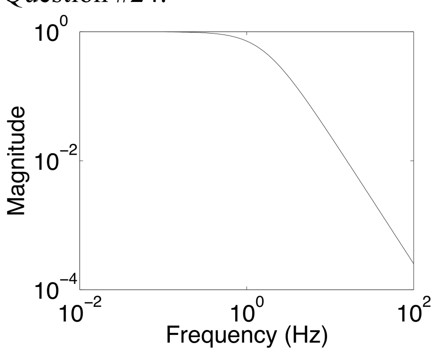
Question #22:



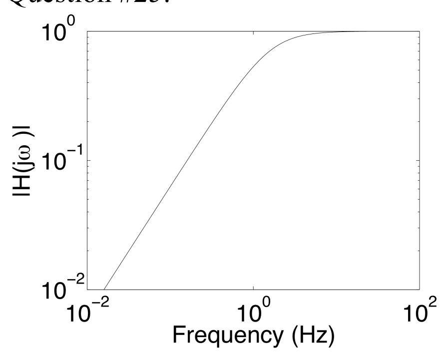
Question #23:



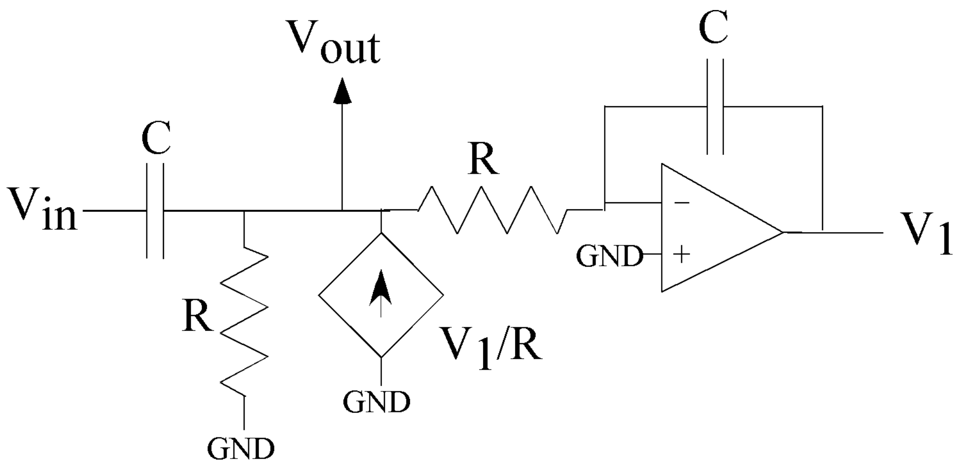
Question #24:



Question #25:



Questions 26-33 relate to the circuit below (R = 1kΩ, C = 1nF).



26. What is the relationship for an input signal at V_{out} to V_1?
a. V_1- V_{out}
b. V_1= - s (1μs) V_{out}
c. V_1= - V_{out}/ (s (1μs)
d. V_1= - V_{out}/ (1 + s (1μs))^2
e. V_1= - V_{out}/ (1 + s (1μs)

27. What is operation for an input signal at V_{out} to V_1?
a. Gain
b. Attenuation
c. Integration
d. Low-Pass Filtering
e. Differentiation

28. What is the input impedance of the circuit right of the V_{out} point?
a. Resistor: 1kΩ
b. Resistor: 2kΩ
c. Series Resistor (1kΩ) and Capacitor(1nF)
d. Capacitor(1nF)
e. Inductor (1mH)

30. What are the roots of this transfer function:
a. One real root
b. Two different complex roots
c. Two identical real roots
d. Two different real roots
e. Two different imaginary roots

29. What is the magnitude gain of this circuit at 160kHz?
a. 4
b. 2
c. 1
d. 0.5
e. 0.25

31. What is the magnitude of the output impedance (V_{out}) of this circuit at 160kHz?
a. 1/4kΩ
b. 1/2kΩ
c. 1kΩ
d. 2kΩ
e. 4kΩ

32: The filter function of this circuit is:
a. First-Order High-Pass Filter
b. Bandpass Filter (Second-Order Filter)
c. Second-Order High-Pass Filter
d. First-Order Low-Pass Filter
e. Second-Order Low-Pass Filter

33. The transfer function of this circuit from V_{in} to V_{out} (within a gain factor) is best described by

a. $$H(s) = \frac{s\tau}{1 + s\tau}$$

b. $$H(s) = \frac{\tau s}{1 + s\tau/Q + s^2\tau^2}$$

c. $$H(s) = \frac{\tau^2 s^2}{1 + s\tau/Q + s^2\tau^2}$$

d. $$H(s) = \frac{1}{1 + s\tau/Q + s^2\tau^2}$$

e. $$H(s) = \frac{1}{1 + s\tau}$$

Name ___Solutions___ Grade = /100
(1 point)

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Spring 2019

Each question is worth 3 points.
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.
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Choose the *best possible answer* available in all cases.

1. D
2. B
3. A
4. E
5. C
6. A
7. C
8. B
9. E
10. D
11. A
12. B
13. C
14. E
15. D
16. D
17. B
18. E
19. A
20. C
21. B
22. D
23. A
24. E
25. C
26. C
27. C
28. E
Inductor; Gyrator Circuit
29. D
Gain = |j Q | = 1/2
30. C
31. B
(Two R in parallel, L and C cancel at resonance)
R into Op-Amp is to GND so in parallel with the other R.
32. C
33. C