Test Seven Topics:

- AC Reactance, Impedance, Power Factor
- RCL Circuit Analysis
  - Calculate Series RCL Impedance
  - Calculate Series RCL Resonance Frequency
  - Determine whether Series RCL circuit at resonance has maximum or minimum current
  - Calculate Parallel RCL Impedance
  - Calculate Parallel RCL Resonance Frequency
  - Determine whether Parallel RCL circuit at resonance has maximum or minimum current
- RCL Passive Filters
  - Using a schematic of a RC or RL circuit, determine if the circuit depicts a low pass filter or a high pass filter
  - Calculate the time constant
  - Calculate the filter's cut-off frequency
  - Sketch the V_{out} / V_{in} Curve
    - Label both axes, the horizontal asymptote, the cut-off frequency, and the ½ power point

Review materials include:

- Reading Assignments & Homework Problems
- Course Notes
- Additional Review Problems (Reactance, Filters)
- Reactance & Filter Quizzes

For the test, you may use:

- a calculator,
- two page of YOUR OWN self-generated review notes

*Note: Phones may **NOT** be used during the exam; NOT as calculators, NOT as Internet connections, NOT for resource retrieval (i.e., electronic copies of notes, files, tables, etc.), NOT for communications. If the exam proctor suspects the use of a phone during the exam, your test will be confiscated and zero points will be assigned.*

See following pages for additional reviews problems and quizzes.

Calculate Capacitive and Inductive Reactance and Complex Impedance
Calculate Series & Parallel Equivalent Impedance for Resistors, Capacitors, Inductors, Impedances
Determine Passive RC and RL Passive Filter Characteristics

1. Calculate Series & Parallel Impedance Frequency = 420 Hz.

RCL Series Configuration	RCL Parallel Configuration
R = 20 Ω	R = 20 Ω
C = 25 μF	C = 25 μF
L = 50 mH	L = 50 mH

Answers:
R = 20 Ohms XC = 15.2 Ohms XL = 131.9 Ohms
RCL Series Configuration Z = 20 + j 116.8 Z = 118.5 @ 80.3 □
RCL Parallel Configuration Z = 8.46 - j 9.88 Z = 13.0 @ -49.4

2. For Figure A, calculate the circuit impedance if the excitation frequency is 1800 Hz. (Answer: Z = 300 + j 6428)

3. For Figure B, calculate the circuit impedance if the excitation frequency is 900 KHz. (Answer: Z = 3000 + j 186)

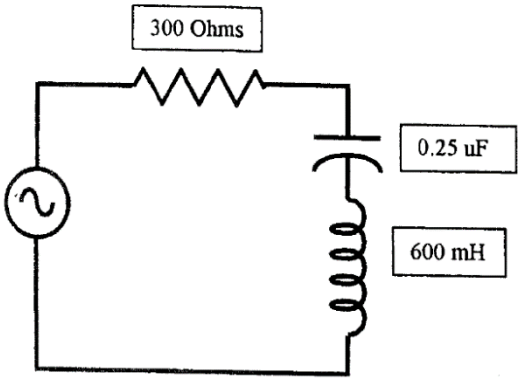


Figure A

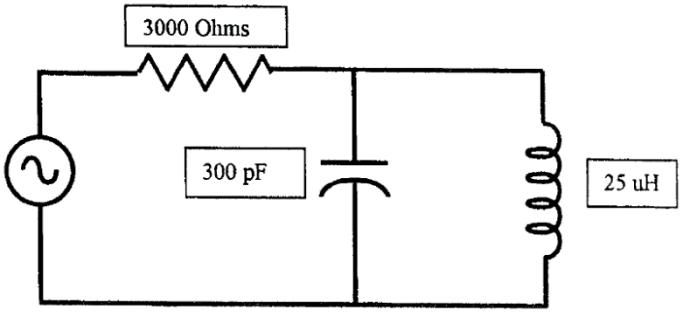


Figure B

4. Sketch RC Filter & V_{out}/V_{in} Curve
a. Calculate the cut-off frequency (half power point) if R = 1500 ohms and C = 0.100 uF. (Answer f_0 = 1060 Hz)
b. Calculate the time constant. (Answer t = 0.9 msec)
c. Sketch the circuit for a RC low pass filter
d. Sketch the circuit for a RC high pass filter

5. Sketch RL Filter & V_{out}/V_{in} Curve
a. Calculate the cut-off frequency (half power point) if R = 1500 ohms and L =12 H. (Answer f_0 = 20 Hz)
b. Calculate the time constant. (Answer t = 8 msec)
c. Sketch the circuit for a RL low pass filter
d. Sketch the circuit for a RL high pass filter

6. Passive Filter Recognition Quiz (see page 2).

Passive Filter Quick Recognition Quiz

For each of the four schematics, indicate whether or not the configuration represents a *Low Pass Filter* or a *High Pass Filter*.

Hint: Consider the reactance when $\omega = 0$.

$X_L = 0$	$V_L = 0$	$V_R = V_{in}$
$X_C >> 0$	$V_C = V_{in}$	$V_R = 0$

If $V_{out} = V_{in}$, then since $\omega = 0$, passes low frequencies, hence Low Pass Filter.

If $V_{out} = 0$, then since $\omega = 0$, blocks low frequencies, hence passes only high frequencies, i.e., High Pass Filter.

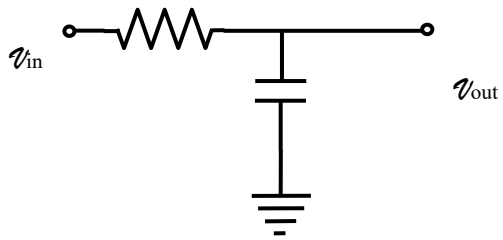
Similarly: Consider the reactance when $\omega >> 0$.

$X_L >> 0$	$V_L = V_{in}$	$V_R = 0$
$X_C = 0$	$V_C = 0$	$V_R = V_{in}$

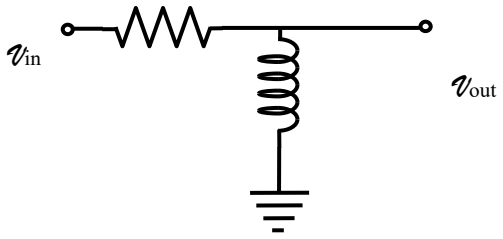
If $V_{out} = V_{in}$, then since $\omega >> 0$, passes high frequencies, hence High Pass Filter.

If $V_{out} = 0$, then since $\omega >> 0$, blocks high frequencies, hence passes only low frequencies, i.e., Low Pass Filter.

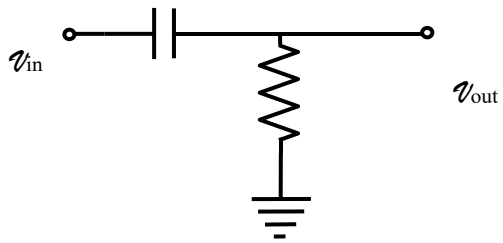
A.



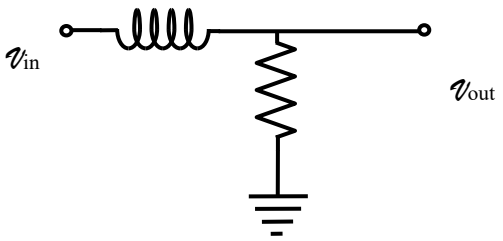
B.



C.



D.



A. _____ **B.** _____

C. _____ **D.** _____

Answers on page 2.

Passive Filter Quick Recognition Quiz - Answers

A. Low Pass

B. High Pass

C. High Pass

D. Low Pass