Exam1

ⓘ This is a preview of the published version of the quiz

Started: Dec 9 at 7:30pm

Quiz Instructions

This exam is open book, open notes, you may use any online/hardback textbooks you like. You may use calculators and matlab, but may not collaborate with other people. All multiple choice and fill-in-the-blank answers should be within 5% of correct value.

Unless stated otherwise in the question, use 1 decimal precision in fill-in-the blank questions, such as "132.3" or "58.0" for example. Also, canvas might force you to enter a leading "0" for numbers less than one, such as "0.11" and entries such as ".11" might be disallowed.

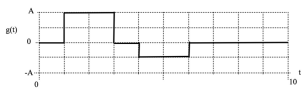
As always, make sure that you are in a location with good internet connectivity during the exam. It is not a bad idea to practice tethering through your cellphone as a backup to your regular internet access. Make sure your browser is compatible with canvas.

I may monitor my email tpweldon@uncc.edu (mailto:tpweldon@uncc.edu) during the exam, in case of some major urgent issue during the exam. Because the exam is online, most issues will have to wait until after the exam is completed, so do not expect any reply to any email, and **proceed on** with the exam even if you send an email.

Question 1 — 5 pts

The frequency of cos(80t) in rad/s is

Question 2 — 5 pts



For A=6 above, the energy of signal g(t) shown above is E_g=

Question 3 — 5 pts

The first zero-crossing bandwidth in Hz of the Fourier transform of g(t)=Π(7t/0.001) is

Question 4 — 5 pts

For a DSB-LC signal with modulation index m=1/5, the power efficiency (to four decimal places) is η=

Question 5 — 5 pts

The bandwidth in Hz of the DSB-LC signal g(t) = cos(37πt) cos(5000t)

Question 6 — 5 pts

For signal g(t) with autocorrelation $R_g(\tau) = 3\Delta^2\left(\frac{\tau}{5}\right)$, the power of the signal is P_g=

- 3
- 9
- none above
- 9/5
- 5

Question 7 — 5 pts

Given g(t)= 5 sin(100πt) +9 cos(400πt),

the power P_g of the signal g(t) is P_g =

Question 8

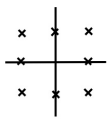
5 pts

A full-wave rectifier can be best used to demodulate

- USB
- SSB
- DSB-SC
- DSB-LC

Question 9

5 pts



A QAM modulator with the constellation diagram above can encode

- 1 bit
- 4 bits
- 3 bits
- none above
- 2 bits

Question 10

5 pts

The Fourier transform of the autocorrelation $R_g(\tau)$ is the power spectral density $S_g(f)$.

- True
- False

Question 11

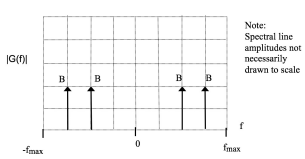
5 pts

A cube root of -j is

- $e^{j2\pi/3}$
- none above
- $e^{-j5\pi/6}$
- $e^{j3\pi/8}$

Question 12

5 pts

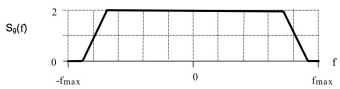


For a DSB-SC signal g(t) having |G(f)| above with B=0.5 and with f_{max}=2000 Hz, the *modulation* frequency is f_m=

- 1000 Hz
- 500 Hz
- none above
- 250 Hz
- 1250 Hz

Question 13

5 pts

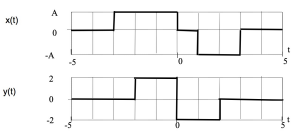


For a system with power spectral density $S_g(f)$ above with f_{max}=500 Hz, the signal power is P_g=

- 3200
- 400
- none above
- 1600
- 800

Question 14

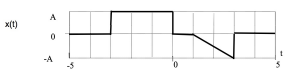
5 pts



For A=4 above, the inner product < x(t), y(t) > on the time interval [-4,4] is

Question 15

5 pts



For A=6 above, the dc response of a system with impulse response x(t) above is $X(f)|_{f=0}$=

Question 16

5 pts

For a DSB-LC signal g(t) = { 10 + 8cos(30πt) }cos($10^6\pi$t), the modulation index (**to two decimal places**) is μ=

Question 17

5 pts

For the signal g(t) = $e^{-16\pi t}$ u(t), the 3 dB bandwidth **in Hz** (**to two decimal places**) is

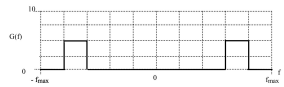
Question 18

5 pts

For a system with frequency response G(f) = sinc(f) $e^{-j9\pi f}$, the group delay in seconds (**to two decimal places**) near 0 Hz is

Question 19

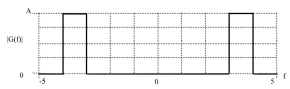
5 pts



For fmax=1 kHz above, the bandwidth of G(f) above **in Hz** is

Question 20

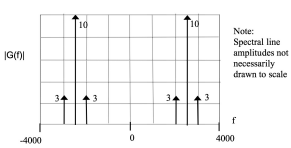
5 pts



For A=8 above, the energy of the signal g(t) with Fourier transform magnitude |G(f)| above is E_g=

Question 21

25 pts



The following questions refer to the DSB-LC signal

$g(t)=(B + C \cos(2\pi f_m t)) \cos(2\pi f_c t)$,

with modulation index m, carrier frequency f_c, and sinusoidal modulating signal m(t) with modulation frequency f_m, and magnitude |G(f)| as shown above.

NOTE: you must use dropdown menus below to answer **all parts** of this question.

Part 1: The carrier frequency in Hz is f_c = [Select]

Part 2: The modulating frequency in Hz is f_m = [Select]

Part 3: The modulation index μ = [Select]

Part 4: The carrier amplitude B in the *time-domain* signal equation for g(t) above equals [Select]

Part 5: The power in each sideband is how many dB below the carrier power? [Select]

No new data to save. Last checked at 7:30pm

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