Stud [redacted] Student [redacted]

University of Saskatchewan

EE 352 Communication Systems I

Quiz #1 – Friday, Feb.11/2011

Time: 25 minutes

Permitted: - text, printed workbook, no other materials
Use the space below each question for your answer.

*1 /2
*2 2 /2
*3 1 /1
*4 Ø /1
*5 1 /1
*6 1½ /2
*7 Ø /1

5½

*1 Calculate the following to one decimal place. (p2.8) (2 points)

a) an audio amplifier has voltage gain of 400. What is the voltage gain in dB?

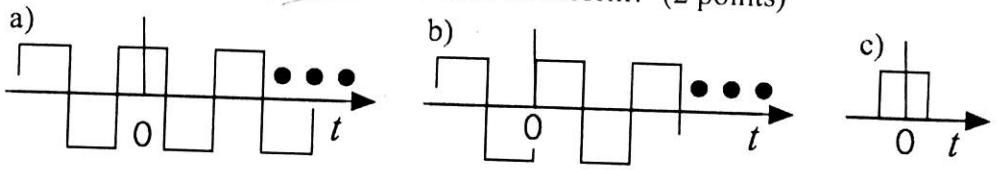
b) a microwave amplifier has power gain of +13 dB. What is the ratio of output power to input power?

a) $V_G = 10\log_{10} 400 = 26.0205$ dB ✓

b) $13\text{dB} = 20\log\frac{P_o}{P_i} \Rightarrow \frac{P_o}{P_i} = 10^{(13/20)} = 4.4668$ ×

a) ×26.0 dB
b) 4.5

*2 The following waveforms are obtained from a laboratory function generator. The Fourier transform (or series) is caculated from some arbitrity reference point ($t = 0$). What are the spectral properties of each waveform? (2 points)



Transform Properties	a)	b)	c)
Fourier Series or Transform	Series ✓	Series ✓	Transform ✓
Real, complex or imaginary	real ✓	imaginary ✓	real ✓
Units: volts or volts/Hz	Volts ✓	Volts ✓	Volts/Hz ✓
Negative frequency: symmetric or non-symmetric?	Symmetric	~~non~~-Symmetric	Symmetric

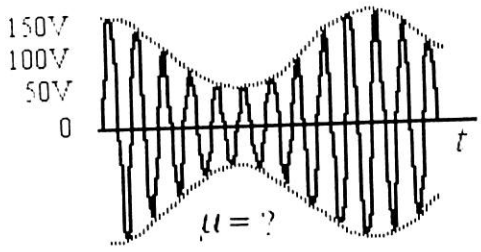
*3. Complete the following drill problem (1 point)

Drill Problem 3.3 – AM Power Efficiency - For a carrier signal $c(t) = Vp \cos 2\pi 600000t$ and sinusoidal modulation, complete the following table. Refer to Example 3.3.

Carrier Vp	Pc (kW)	μ	Vp $s(t)$	Ptot (kW)	Vp/rms $s(t)$	η(%)	PEP (kW)	Checksum
100 V	5	0.5	150	5.625	2.0	11.1	11.25	185.5
200 V	20	0.75	350	25.625	2.18	22.0	61.25	481.8
200 V	20	0.9	380	28.10	2.27	28.8	72.2	532.3
300 V	45	0.75	525	57.656	2.19	22.0	137.8	790.4
Checksum	**90**	**2.90**	**1405**	**117.0**	**8.64**	**83.8**	**282.5**	**1989.9**

✓ ✓ ✓ ✓ ✓ ✓ ✓

*4 What is the modulation index for the AM signal illustrated below? (1 pt)



$u \approx 100$ X

*5 Stereo AM sends two signals in the same bandwidth as the monaural AM broadcast system. (1 pt)

a) What modulation scheme is used ? Circle answers. DSB, SSB, QAM, VSB, or FM

b) Why send L+R and L-R information instead of L and R?

Compatability with older receivers. (They can demodulate the signal as usual using an envelope detector)

*6 Fill in the table for the siganls a, b and c which have the spectra illustrated below. The symbol $m_x(t)$ is to indicate a general complex signal. (2 pts)

Signal Properties	a)	b)	c)
Real, Complex or Imaginary	Complex Imaginary	Real ✓	Complex ✓
baseband, broadband or narrowband	narrowband baseband	broadband	baseband
analytic?	Yes ✓	No ✓	Yes X
"1-wire" or "2-wire"	2-wire 1 wire	1 wire ✓	2 wire ✓
$m(t)$, $m_n(t)$, $m_p(t)$ or $m_x(t)$	$m_p(t)$ ✓	$m(t)$ ✓	$m_x(t)$ ✓

*7 Determine the Nyquist (minimum) sampling rate for the energy signal $m(t) = \sin(\pi 800t)/\pi 800t$. (p5.3)

$800 \times 2 = \boxed{1600} = f_{\text{sampling rate}}$ X

END