Serial # 0

- 1 points for not writing your serial number

King Fahd University of Petroleum & Minerals
Electrical Engineering Department
EE207: Signals and Systems (081)
Quiz 7: Discrete Signals

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The signal

$$x(t) = 2 + 8\sin(16\pi t) \quad t \leftarrow nT_s$$

$$= 2 + 8\sin(2\pi(8)t)$$

$$= 2 + 8\sin(2\pi(8)nT_s)$$

is sampled at a frequency 20 samples per second.

1) Find the time and amplitude of the first three samples

$f_s = 20$ samples/sec.

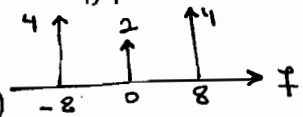
$T_s = \frac{1}{f_s} = \frac{1}{20} = 0.05$ sec

n	time nT_s	value $x(nT_s)$
0	0	2
1	0.05	6.7023
2	0.1	-5.6085

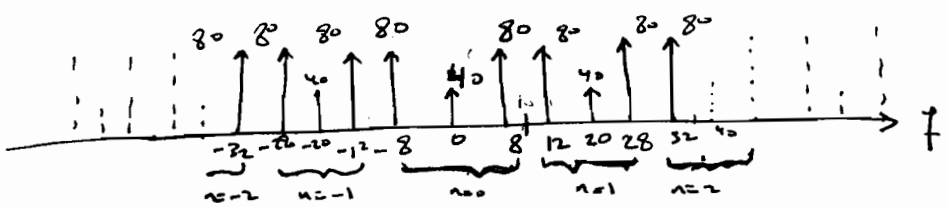
3

2) Plot the magnitude spectrum of the sampled signal for $|f| < 35Hz$.

Spectrum of the unsampled signal $X(f)$ — $X(f)$



$$X_s(f) = f_s \sum_{n=-\infty}^{\infty} X(f - nf_s) = 20 \sum_{n=-\infty}^{\infty} X(f - n20)$$



5

3) Specify the LPF characteristics to recover the original signal

Amplitude $= T_s = \frac{1}{20} = 0.05$

(BW) Bandwidth $= \frac{f_s}{2} = 10$ Hz or $8 < BW < 12$ Hz.

2

4) For an 8 bit quantizer the dynamic range =16 V. The input signal has a power of 36 Watts, what is the output SNR in dB assuming uniform errors.

P_s

$$(SNR)_{dB} = 10.79 + 6.02n + 10\log_{10} P_s - 20\log_{10} D$$

$$= 10.79 + 6.02(8) + 10\log_{10}(36) - 20\log_{10}(16)$$

$$= 50.4306 \text{ dB}$$

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Good Luck, **Dr. Ali Muqaibel**