ENEE 222: 2/14 Class

Material: Lecture videos **5.2**, **6.1**, **6.2**

1. If $x(t) = \cos(2\pi f t + \phi)$, for which (one or more) of the following sampling rates f_s is the sample sequence obtained from $x(t)$ given by

$$x[n] = \cos\left(\frac{2\pi n}{5} + \phi\right) \qquad \text{or} \qquad x[n] = \cos\left(\frac{2\pi n}{5} - \phi\right) ?$$

(f is in Hertz and f_s in samples/second.)

A. $f_s = 0.625f$

B. $f_s = 1.25f$

C. $f_s = 2.5f$

D. $f_s = 5f$

2. Which (one or more) of the following frequencies (in Hz) becomes an alias of $f = 30$ Hz when the sampling rate equals $f_s = 150$ samples per second?

A. 90

B. 120

C. 210

D. 270

3. Which (if any) of the following continuous-time signals $x(t)$ produce

$$x(nT_s) = x[n] = 7\cos(0.4\pi n)$$

when $f_s = 1/T_s = 150$ samples/sec?

A. $x(t) = 3\cos(60\pi t) + 4\cos(540\pi t)$

B. $x(t) = \cos(240\pi t) + 6\cos(420\pi t)$

C. $x(t) = 2\cos(180\pi t) + 5\cos(360\pi t)$

D. $x(t) = 6\cos(660\pi t) + \cos(840\pi t)$

4. (HW 6 $\subset$ v) The *two* highest values of f_s (in samples/second) such that 72 Hz and 128 Hz are aliases of each other include

A. $f_s = 56$

B. $f_s = 100$

C. $f_s = 200$

D. $f_s = 400$

5. **(HW 6 ∼iii)** The discrete-time sinusoid $x[n] = A\cos(0.375\pi n + \phi)$ was obtained by sampling a continuous-time sinusoid $x(t)$ at a rate of 640 samples per second. If it is known that the frequency of $x(t)$ is in the range 640 to 960 Hz, write an equation for $x(t)$.

6. **(HW 6 ∼iv)** Once again, $x[n] = A\cos(0.375\pi n + \phi)$ was obtained by sampling $x(t)$ at a rate of 640 samples per second. If it is known that the frequency of $x(t)$ is in the range 320 to 640 Hz, write an equation for $x(t)$.

7. **(HW 5 ii)** Using phasors, express

$$y(t) \;=\; x(t) + 2x(t - (\pi/4\Omega))$$

as a single sinusoid, leaving your answer in terms of A, Ω and ϕ.