ENEE 222: 2/12 Class

Material: Lecture videos **4.2**, **5.1**, **5.2**

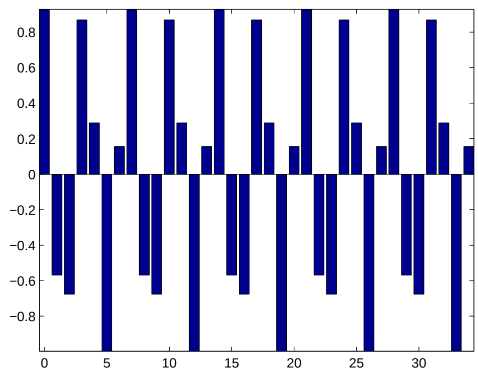
1. How many distinct values does the discrete-time sinusoid

$$x[n] = \cos\left(\frac{\pi n}{4}\right)$$

take as n ranges over all integers (positive and negative)?

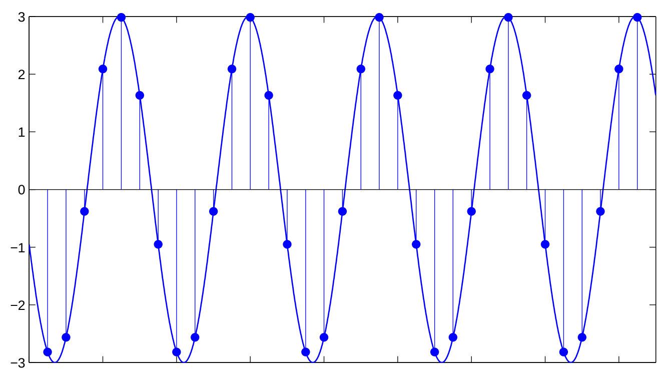
A. Four B. Five C. Six D. Eight

2. Shown below is a bar plot of the discrete-time sinusoid $\cos(\omega n + \phi)$. Which of the following values of ω is most consistent with this plot?



A. $\omega = 4\pi/7$ B. $\omega = 5\pi/7$ C. $\omega = 4\pi/9$ D. $\omega = 5\pi/9$

3. The continuous-time sinusoid $x(t) = 3\cos(\Omega t + \phi)$ is plotted below (solid line). The stem plot is the sequence of samples $x[n] = x(nT_s)$.



What is the relationship between the sampling period T_s and the period T of $x(t)$?

A. $T_s = T$ B. $T_s = T/2$ C. $T_s = T/7$ D. $T_s = 2T/7$

4. Which (one or more) of the following equations describes the sample sequence $x[n]$ obtained in **3** above?

A. $x[n] = 3\cos\left(\frac{\pi n}{7} + \phi\right)$

B. $x[n] = 3\cos\left(\frac{2\pi n}{7} + \phi\right)$

C. $x[n] = 3\cos\left(\frac{13\pi n}{7} - \phi\right)$

D. $x[n] = 3\cos\left(\frac{12\pi n}{7} - \phi\right)$

5. (HW 4 $\supset$ iii) If the sequences $x[n]$ and $y[n]$ are periodic with periods N_x and N_y (respectively), explain why $z[n] = x[n] + y[n]$ is periodic with period equal to $\mathrm{LCM}(N_x, N_y)$. Is a shorter period also possible for $z[n]$?

In the remaining items, $x(t) = A\cos(\Omega t + \phi)$ *and* $x[n] = x(nT_s)$.

6. (HW 5 iii) Determine all values of T_s such that $x[n]$ is constant at all times n.

7. (HW 5 $\subset$ iv) Determine the only value of T_s in $[0, T]$ such that $x[n] = A\cos((\pi/12)n + \phi)$.

8. (HW 5 $\subset$ vi) Determine the only value of T_s in $[0, T]$ such that $x[n] = A\cos((5\pi/6)n - \phi)$.

If time permits:

9. (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.