PROBLEM:

Circle the correct answer to each of these short answer questions, and give a brief explanation:

1. Suppose that the discrete-time signal $x[n]$ is $x[n] = 99\cos(0.4\pi n - 0.8\pi)$ determine the frequency (in Hz) of the analog signal $y(t)$ that will be reconstructed by the ideal D-to-C converter operating at a sampling rate of 10,000 samples/second.

   (a) $f = 8000$ Hz
   (b) $f = 4000$ Hz
   (c) $f = 2000$ Hz
   (d) $f = 1000$ Hz
   (e) $f = 0.2$ Hz

2. A continuous-time signal $x(t)$ is defined by the Fourier Series sum: $x(t) = \sum_{k=-10}^{10} jke^{j16\pi kt}$.
   The Nyquist Rate for sampling $x(t)$ is

   (a) 20 Hz
   (b) 40 Hz
   (c) 80 Hz
   (d) 160 Hz
   (e) 320 Hz

3. A rotating disk with one spot is spinning *clockwise* at the rate of 10 revolutions per second. If the disk is illuminated with a strobe light that flashes once every 0.2 seconds, determine the movement of the spot that you will see.

   (a) The spot appears to *stand still.*
   (b) The spot appears to rotate *counter-clockwise* at a rate of 1 revolutions per second.
   (c) The spot appears to rotate *counter-clockwise* at a rate of 2 revolutions per second.
   (d) The spot appears to rotate *clockwise* at a rate of 1 revolutions per second.
   (e) The spot appears to rotate *clockwise* at a rate of 2 revolutions per second.

4. Suppose that the discrete-time signal $x[n] = \cos(0.8\pi n)$ is the input to an FIR filter whose frequency response is shown on the next page. Determine the output signal, $y[n]$.

   (a) $y[n] = 3\cos(\hat{\omega})\, e^{-j\hat{\omega}} \cos(0.8\pi n)$
   (b) $y[n] = 0.62\cos(0.4\pi n + 0.2\pi)$
   (c) $y[n] = 0.62\cos(0.8\pi n - 0.2\pi)$
   (d) $y[n] = 0.62\cos(0.8\pi n + 0.2\pi)$
   (e) $y[n] = 0.5\cos(0.8\pi n + 0.2\pi)$
   (f) $y[n] = 0$