DSP Exercises

The **due date** for this homework is **Sun 14 Apr 2013 8:00 PM EDT**.

Question 1

On a 16-bit computer, where *signed* integers are represented with a single 16-bit word, what is the range of numbers that can be represented?

- $[0, 2^{16} - 1]$
- $[-2^{16}, 2^{16} - 1]$
- $[-2^{15}, 2^{15} - 1]$

Question 2

What decimal number does the binary number 101010 equal? Type your answer as an integer without a decimal point.

Question 3

What is the sum of the two binary numbers 101 and 111 expressed as a binary number?

- 1100
- 100
- 010

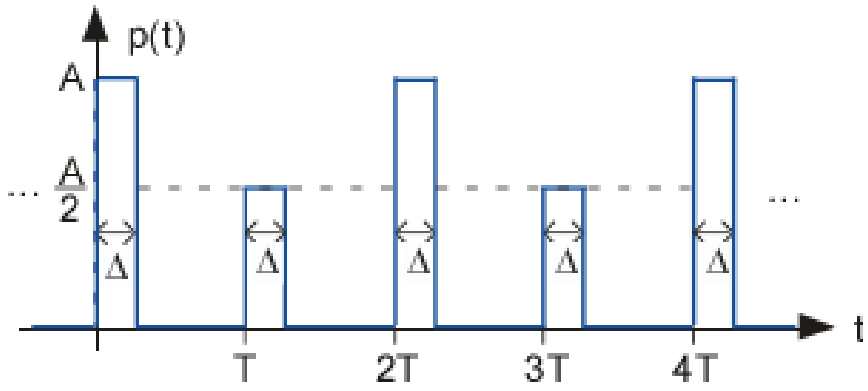
Question 4

Suppose the *periodic* signal $s(t)$, with its period equalling T, has Fourier series coefficients c_k. What are the Fourier series coefficients of $s\left(t - \frac{T}{2}\right)$ in terms of c_k? Use `ck` to represent c_k. For example, if your answer is $\frac{1}{2}\,c_k$, type `ck/2`.

Preview

Question 5

An A/D converter has a curious problem: every other sampling pulse is half its normal amplitude.



Can this signal be used to sample a signal having highest frequency $W = \frac{1}{2T}$?

- Sometimes
- No
- Yes

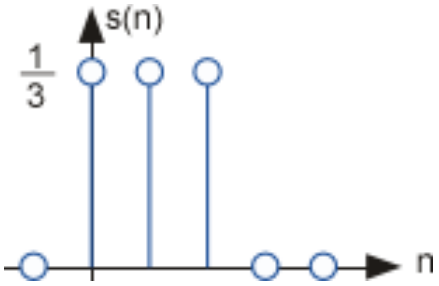
Question 6

A discrete-time sinusoid is given by $\sin 2\pi f_0 n$. What is this signal's period?

- The discrete-time sinusoid is not periodic.
- N when $f_0 = \frac{1}{N}$.
- $\frac{1}{f_0}$

Question 7

Which of the following expressions correspond to the depicted pulse signal? Check *all* that are correct.



- [ ] $\frac{1}{3}\left(\delta(n) + \delta(n-1) + \delta(n-2)\right)$
- [ ] $\frac{1}{3}\left(\mathrm{u}(n) - \mathrm{u}(n-2)\right)$
- [ ] $\frac{1}{3}\left(\delta(n) + \delta(n-2)\right)$
- [ ] $\frac{1}{3}\left(\mathrm{u}(n) - \mathrm{u}(n-3)\right)$

- [ ] In accordance with the Honor Code, I certify that my answers here are my own work.

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