

EECS20n, Quiz 6, 11/2/04

The quiz will take 10 minutes. Write your response on the sheet. Print your name and lab time here:

Last Name _____ First _____ Lab time _____

1. Let $g : \text{Ints} \rightarrow \text{Reals}$ be any signal. Let $p \in \text{Ints}$ and define $f : \text{Ints} \rightarrow \text{Reals}$ by

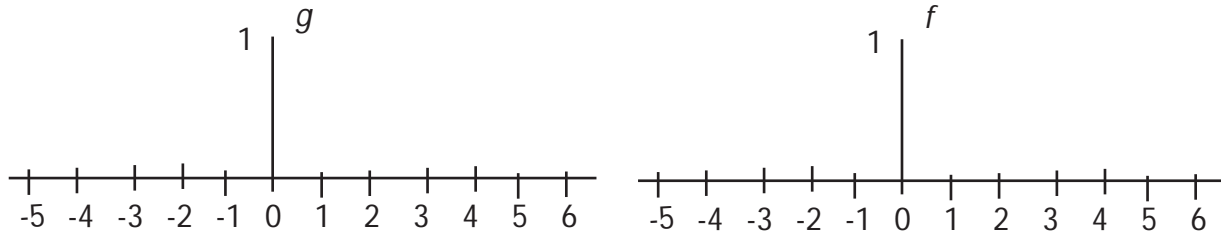
$$\forall n, \quad f(n) = \sum_{k=-\infty}^{\infty} g(n - kp). \quad (1)$$

i. **2 points** Prove that f is periodic with period p .

ii. **2 points** Suppose g is given by

$$\forall n, \quad g(n) = \begin{cases} 0.5, & n = 0, 5 \\ 1, & 1 \leq n \leq 4 \\ 0, & n > 5 \end{cases}$$

Plot g and f given by (1) for $p = 5$.



2. **3 points** For the signals $x : \text{Ints} \rightarrow \mathbb{C}$ given below, determine if x is periodic (Y or N); and if it is periodic, determine its period.

$\forall n, x(n) =$	x is periodic (Y or N)	period of x is
$e^{i\frac{2}{5}\pi n}$		
$e^{i\frac{2}{5}\pi n} + e^{i\frac{2}{3}\pi n}$		
$e^{i\sqrt{2}\pi n}$		

3. Suppose a differentiable periodic signal f has the Fourier Series representation

$$\forall t \in \text{Reals}, \quad f(t) = A_0 + \sum_{k=1}^{\infty} A_k \cos(k\omega_0 t + \phi_k).$$

Its derivative g has Fourier Series representation: $\forall t, g(t) = B_0 + \sum_{k=1}^{\infty} B_k \cos(k\omega_0 t + \theta_k)$.

3 points Determine $B_0, B_k \geq 0, \theta_k$ in terms of A_0, A_k, ϕ_k

$$B_0 = \quad, B_k = \quad, \theta_k =$$