

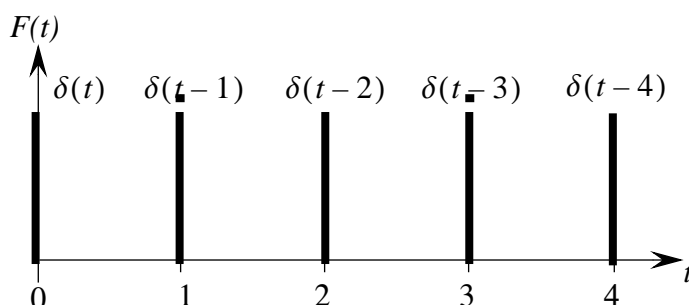
## ME 460/660 Exam 2, Fall '96

One equation sheet. Front and back. No examples. No derivations. It must be turned in with the exam.

- 1) Find the Fourier series representation of the following function (see figure below):

$$F(t) = \sum_{a=-\infty}^{\infty} \delta(t-a)$$

( $a$  is the set of integers between  $-\infty$  and  $\infty$ . Write the series in the simplest form AND write the first 3 non-zero terms. Recall that the integral of a Dirac delta function times another function is equal to the “another function” evaluated when the argument of the Dirac delta function is zero. (20 points)



- 2) A 0.5 kg CD player is to be mounted inside a car. The motion of the car has a 5 cm amplitude and a frequency of 10 Hz. Design a suspension system for the CD player such that the acceleration stays below 0.05 gees. (1 gee = 9.8 m/s<sup>2</sup>) (20 points).
- 3) Design an accelerometer (choose  $c$  and  $k$ ) that will be accurate to 1% over the frequency range 0 to 50 Hz. The mass is 1 gm. (20 points) Note:

$$\frac{Z}{Y} = \frac{r^2}{\sqrt{(1-r^2)^2 + (2\zeta r)^2}}$$

- 4) Derive the equation of motion for the following balance. Assume that the **right angles in the bar are rigid** and that the weights are balanced. (20 points bonus for first exam).

