Name: _____

Problem	Points	Score
1(a)	15	
1(b)	15	
2(a)	10	
2(b)	10	
2(c)	5	
2(d)	5	
2(e)	10	
3(a)	15	
3(b)	15	
Total	100	

Notes:

(1) The exam is closed books and notes except for one double-sided sheet of notes.
(2) Please indicate clearly your answer to the problem.
(3) If I can't read or follow your solution, it is wrong and no partial credit will be awarded.

Problem No. 1: Consider the LTCC difference equation: $y[n] = 0.5y[n-2] + 0.25x[n-1]$. Assume the initial conditions are zero.

(a) Find the impulse response.

(b) Is the system stable? Justify your answer using a technique that does not depend on your answer to (a).

Problem No. 2: Students at Temple are graded on a 5 point scale: A,B,C,D, and F. The Registrar, a former graduate of ECE 4522, decides to put this class to good use by developing a program to model the fluctuation of the average GPA at the university. The model the Registrar uses predicts the average GPA for the current year as a function of the number of students enrolled at the beginning of the first semester, the unemployment rate on Jan. 1 of the current year, and the size of the US population for the year corresponding to the current year minus 18 years.

(a) Write an equation that represents a model of this signal.

Is the signal described above (circle all that apply):

one dimensional multidimensional

single channel multichannel

continuous discrete-time

continuous in amplitude digital in amplitude

(b) What is the Nyquist rate for the signal: $x(n) = (sin2\pi 1000t + 7.5\pi)^2$

(c) Given the signal, $x(t) = \begin{cases} (-\frac{1}{2})^{1000t} & |t| < 0.0015\ secs \\ 0 & elsewhere \end{cases}$, compute the value of $x(t)$ at $t = 0.002\ secs$ by sampling at $f_s = 1000\ Hz$, upsampling the signal to a new sample frequency of $f_s = 2000\ Hz$, and evaluating this new discrete signal at $n = 4$ (which corresponds to $t = 0.002\ secs$).

(d) Why is the answer to (c) not equal to $x(t)$ evaluated at $t = 0.002\ secs$?

(e) In class, we discussed that a standard DVD disc can hold about 2 Gbytes of data. How many minutes of digital audio can this disc hold? Be careful to explain and justify any assumptions you make in your answer.

Problem No. 3: For the signal, $x[n] = \{1, 0, 1, 0\}$ and the impulse response, $h[[n] = \{0, 1, 0, 1\}$:

(a) Compute the output, $y[n]$.

(b) Is the system causal? stable? Time-invariant? Explain.