Examination Feedback for EEE201 – Signals and Systems
Autumn Semester 2007-08

Feedback for EEE201 Session:2007-2008

Feedback: Please write simple statements about how well students addressed the exam paper in general and each individual question in particular including common problems/mistakes and areas of concern in the boxes provided below. Increase row height if necessary.

General Comments:

Most of you did better in questions 3 and 4. A number of you had difficulties in question 1 when asked to perform continuous time convolution and in question 2 when asked to analyze a simple modulation and demodulation of a signal.

Question 1:

I am disappointed with a number of you who failed to perform the convolution process. This "book work" problem is similar to one of the examples in the lecture notes and tutorial 2. Using the expressions of y(t) provided, I expected most of you to be able to sketch and label y(t) in part (a) but some of you still struggle with this.

In part (b)(ii), only a few of you have managed to sketch the response correctly. You should have recognized that the response is given by y(t) –y(t-1). In part (b)(iii) you should be able to deduce the effect of the RC time constant on the circuit response. Small value of RC indicates that the circuit has high bandwidth and therefore the output waveform will have similar shape to the input waveform. Consequently for RC<<1, the ISI is minimum and the signal can be decoded easily. Overall, Only a small number of you have managed to answer this question satisfactorily.

Question 2:

Most of you did very well in part (a). Some of you were able to use the frequency shift property of FT to solve part(b) but some of you have derived $X_{mod}(\omega)$ using the FT Integral eqn. While this is not wrong, the 3 marks allocated for part (b), indicates that solving the more time consuming FT integral may not be necessary.

In part (c), very few of you were able to showed that in the synchronous demodulator, the modulated signal $x_{mod}(t)$ is multiplied with the carrier frequency to give $x_{mod}(t)\cos(\omega_c t)$. As before using frequency shift property, the final output signal is given by $Y(\omega) = \frac{1}{2}X(\omega) + \frac{1}{4}X(\omega + 2\omega_c) + \frac{1}{4}X(\omega - 2\omega_c)$. This eqn shows that the bandwidth required has to be larger than the highest frequency in $X(\omega)$, i.e $2\pi/\tau$, but smaller than $2\omega_c - 2\pi/\tau$.

Question 3:

Most of you did well in part (a). In part (b) some of you did not calculate the oscillation frequency of the unit step response when all you needed to do was to use the values of damping factor and natural oscillating frequency that you have calculated earlier and therefore losing marks unnecessarily.

In part (c), I was surprised that a number of you failed to make use of the expression for unit step response provided. Using the expression, you should be able to deduce the changes expected when the natural frequency is doubled but the damping factor remains constant. Most of you did quite well in part (d) demonstrating your ability to use the LT pairs provided.

Question 4:

Most of you did well in this question. However quite a number of you struggled in part (d). To calculate the magnitude of the transfer function at a given frequency, you need to calculate $\left|H(\omega)\right| = \frac{1}{\sqrt{1+\left(j\omega RC\right)^2}} = \frac{1}{\sqrt{1+\left(j\omega/\omega_c\right)^2}}$. Therefore by equating the magnitude of the transfer function at the frequency of the highest harmonic to 0.69 you should be able to work out the value of capacitance required. However some of you wrote $\frac{1}{\sqrt{1+\left(RC\right)^2}} = 0.69$. Here you have lost marks which could have been avoided if you recognized the missing ω term.

Question 5:

Question 6:

Question 7:

Question 8: