KING FAHD UNIVERSITY OF PETROLEUM AND MINERALS

ELECTRICAL ENGINEERING DEPARTMENT

SECOND SEMESTER 2006/2007

EE 207 MAJOR EXAM II

LOCATION: 14-108

DATE: MONDAY 14-5-2007

TIME: 6:30-8:00 PM

Student's Name:…….

Student's I.D. Number: …….

Section Number: ……..……

	Maximum Score	**Score**
Problem 1	**15**	
Problem 2	**15**	
Problem 3	**15**	
Problem 4	**15**	
Total	**60**	

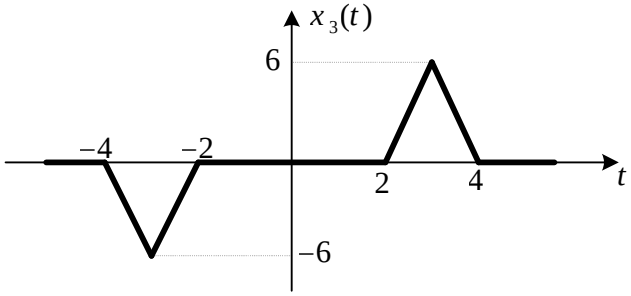
Problem 1 [15 Points]

a) Given that $x_1(t) = \Pi(t)$, use the ***integral definition*** of Fourier Transform to find the Fourier Transform of $x_1(t)$.

b) The signal $x_2(t)$ has the Fourier Transform $X_2(f) = \frac{1}{1 + j\,2\pi f} + \frac{1}{(3 + j\,2\pi f)^2}$

Find the Fourier Transform of $x_2(\frac{t-3}{5})$.

c) Consider the signal $x_3(t)$ shown in following graph:



The Fourier Transform $X_3(f)$ of the above signal is given by (***select an answer***):

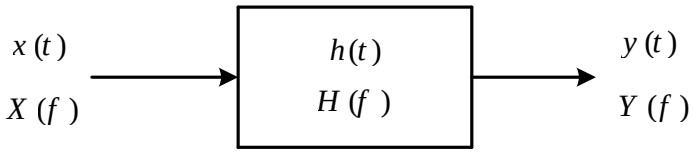
1) $-j12\text{sinc}^2(f)\cos(6\pi f)$ 2) $j12\text{sinc}^2(f)\sin(6\pi f)$ 3) $j6\text{sinc}^2(f)\cos(6\pi f)$

4) $-j12\text{sinc}^2(f)\sin(6\pi f)$ 5) $6\text{sinc}^2(f)\cos(3\pi f)$ 6) $6\text{sinc}^2(f)\sin(3\pi f)$

[***Hint for part c)***: The Fourier Transform of $x(t) = \Lambda(t)$ is $X(f) = \text{sinc}^2(f)$].

Problem 2 [15 Points]

Consider the following LTI (Linear Time Invariant) system, with impulse response $h(t)$.



a) It is known that for time-domain signals, the input-output relation is given by the convolution $y(t) = x(t) * h(t)$.

i) Write the corresponding input-output relationship in the frequency-domain [between $X(f)$, $Y(f)$ and $H(f)$].

ii) Suppose that the impulse response is given by $h(t) = 2\pi \exp(-2\pi t)u(t)$. Use the ***integral definition*** of the Fourier Transform to show that the frequency response is given by $H(f) = 1/(1+jf)$.

iii) Plot the double-sided ***amplitude*** spectrum of $H(f)$ and specify the ***type of filter***.

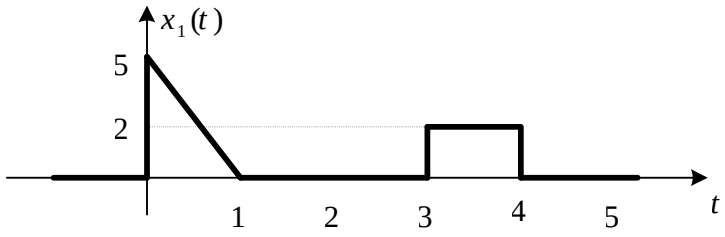
b) Now suppose that the input is given by $x(t) = 5\cos(2\pi t)$, find:

i) $Y(f)$ [Expressed in the ***simplest*** *possible* form].

ii) $y(t)$ [Expressed in the ***simplest*** *possible* form].

Problem 3 [15 Points]

a)



The signal $x_1(t)$ shown above can be expressed in terms of singularity functions as:

$$x_1(t) = 5u(t) - 5r(t) + 5r(t-1) + 2u(t-3) - 2u(t-4)$$

i) Find the La Place Transform of $x_1(t)$.

ii) Find the La Place Transform of $\frac{dx_1(t)}{dt}$.

b) Find the inverse La Place Transform of the signal $X_2(s) = \frac{1}{3s+12}e^{-7s}$.

Problem 4 [15 Points]

Find the inverse La Place Transform of the following signals:

a) $X(s) = \dfrac{5s^2 + 17s + 15}{(s^2 + 5s + 4)(s + 1)}$

b) $Y(s) = \dfrac{2s^2 + 14s + 17}{s^2 + 6s + 10}$