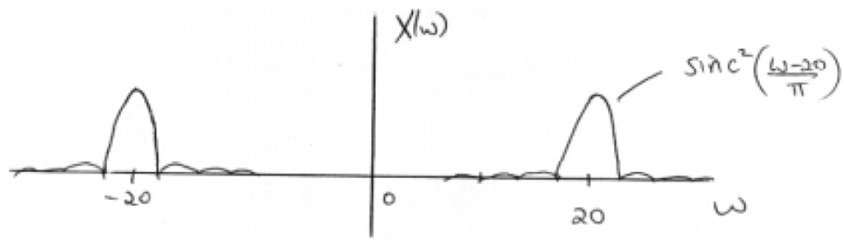
King Fahd University of Petroleum & Minerals
Electrical Engineering Department
EE370: Communications Engineering I (102)
Quiz 2: Fourier Transform

Serial # 0

-1 point for no number

Name: Key ver.1

Compute the inverse Fourier transform of the following signal. (Write your answer in the simplest form)



Final Answer:

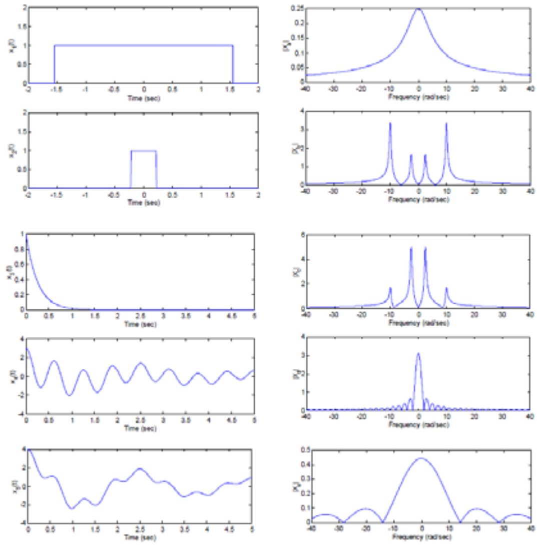
$$\pi\Delta\left(\frac{\pi t}{4}\right)\cos 20t$$

Coefficient	2 points
Δ	1 point
Argument of Δ	2 points
Shifting $\cos 20t$	2 points

Match the time responses $x(t)$ with the corresponding frequency responses $|X|$.

1. ______D____
2. ______E____
3. ______A_____
4. ______B_____
5. ______C____

Notice that 4 & 5 consist of sum of two sinusoidal Signals because the spectrum is made of 4 deltas.
The difference between 4 & 5 is that in 4 the sinusoidal signal with higher frequency is stronger this is why it is mapped to B and 5 is mapped to C



Grading : 5 correct ➔3 points , 3 correct ➔ 2 points, 2 correct ➔1 point , 1➔0.5,0➔0

Good Luck Dr. Ali Muqaibel

Short Table of Fourier Transforms

	$g(t)$	$G(\omega)$	
1	$e^{-at}u(t)$	$\frac{1}{a+j\omega}$	$a>0$
2	$e^{at}u(-t)$	$\frac{1}{a-j\omega}$	$a>0$
3	$e^{-a\|t\|}$	$\frac{2a}{a^2+\omega^2}$	$a>0$
4	$te^{-at}u(t)$	$\frac{1}{(a+j\omega)^2}$	$a>0$
5	$t^n e^{-at}u(t)$	$\frac{n!}{(a+j\omega)^{n+1}}$	$a>0$
6	$\delta(t)$	1	
7	1	$2\pi\delta(\omega)$	
8	$e^{j\omega_0 t}$	$2\pi\delta(\omega-\omega_0)$	
9	$\cos\omega_0 t$	$\pi[\delta(\omega-\omega_0)+\delta(\omega+\omega_0)]$	
10	$\sin\omega_0 t$	$j\pi[\delta(\omega+\omega_0)-\delta(\omega-\omega_0)]$	
11	$u(t)$	$\pi\delta(\omega)+\frac{1}{j\omega}$	
12	$\mathrm{sgn}\, t$	$\frac{2}{j\omega}$	
13	$\cos\omega_0 t\, u(t)$	$\frac{\pi}{2}[\delta(\omega-\omega_0)+\delta(\omega+\omega_0)]+\frac{j\omega}{\omega_0^2-\omega^2}$	
14	$\sin\omega_0 t\, u(t)$	$\frac{\pi}{2j}[\delta(\omega-\omega_0)-\delta(\omega+\omega_0)]+\frac{\omega_0}{\omega_0^2-\omega^2}$	
15	$e^{-at}\sin\omega_0 t\, u(t)$	$\frac{\omega_0}{(a+j\omega)^2+\omega_0^2}$	$a>0$
16	$e^{-at}\cos\omega_0 t\, u(t)$	$\frac{a+j\omega}{(a+j\omega)^2+\omega_0^2}$	$a>0$
17	$\mathrm{rect}\left(\frac{t}{\tau}\right)$	$\tau\,\mathrm{sinc}\left(\frac{\omega\tau}{2}\right)$	
18	$\frac{W}{\pi}\mathrm{sinc}\,(Wt)$	$\mathrm{rect}\left(\frac{\omega}{2W}\right)$	
19	$\Delta\left(\frac{t}{\tau}\right)$	$\frac{\tau}{2}\mathrm{sinc}^2\left(\frac{\omega\tau}{4}\right)$	
20	$\frac{W}{2\pi}\mathrm{sinc}^2\left(\frac{Wt}{2}\right)$	$\Delta\left(\frac{\omega}{2W}\right)$	

Trigonometric Identities

cos A cos B = ½[cos (A+B) + cos (A-B)]

sin A sin B = ½[cos (A-B) – cos (A+B)]

sin A cos B = ½[sin (A+ B) + sin (A- B)]

Fourier Transform Operations

Operation	$g(t)$	$G(\omega)$
Addition	$g_1(t)+g_2(t)$	$G_1(\omega)+G_2(\omega)$
Scalar multiplication	$kg(t)$	$kG(\omega)$
Symmetry	$G(t)$	$2\pi g(-\omega)$
Scaling	$g(at)$	$\frac{1}{\|a\|}G\left(\frac{\omega}{a}\right)$
Time shift	$g(t-t_0)$	$G(\omega)e^{-j\omega t_0}$
Frequency shift	$g(t)e^{j\omega_0 t}$	$G(\omega-\omega_0)$
Time convolution	$g_1(t)*g_2(t)$	$G_1(\omega)G_2(\omega)$
Frequency convolution	$g_1(t)g_2(t)$	$\frac{1}{2\pi}G_1(\omega)*G_2(\omega)$
Time differentiation	$\frac{d^n g}{dt^n}$	$(j\omega)^n G(\omega)$
Time integration	$\int_{-\infty}^{t} g(x)\,dx$	$\frac{G(\omega)}{j\omega}+\pi G(0)\delta(\omega)$