**Question Bank**

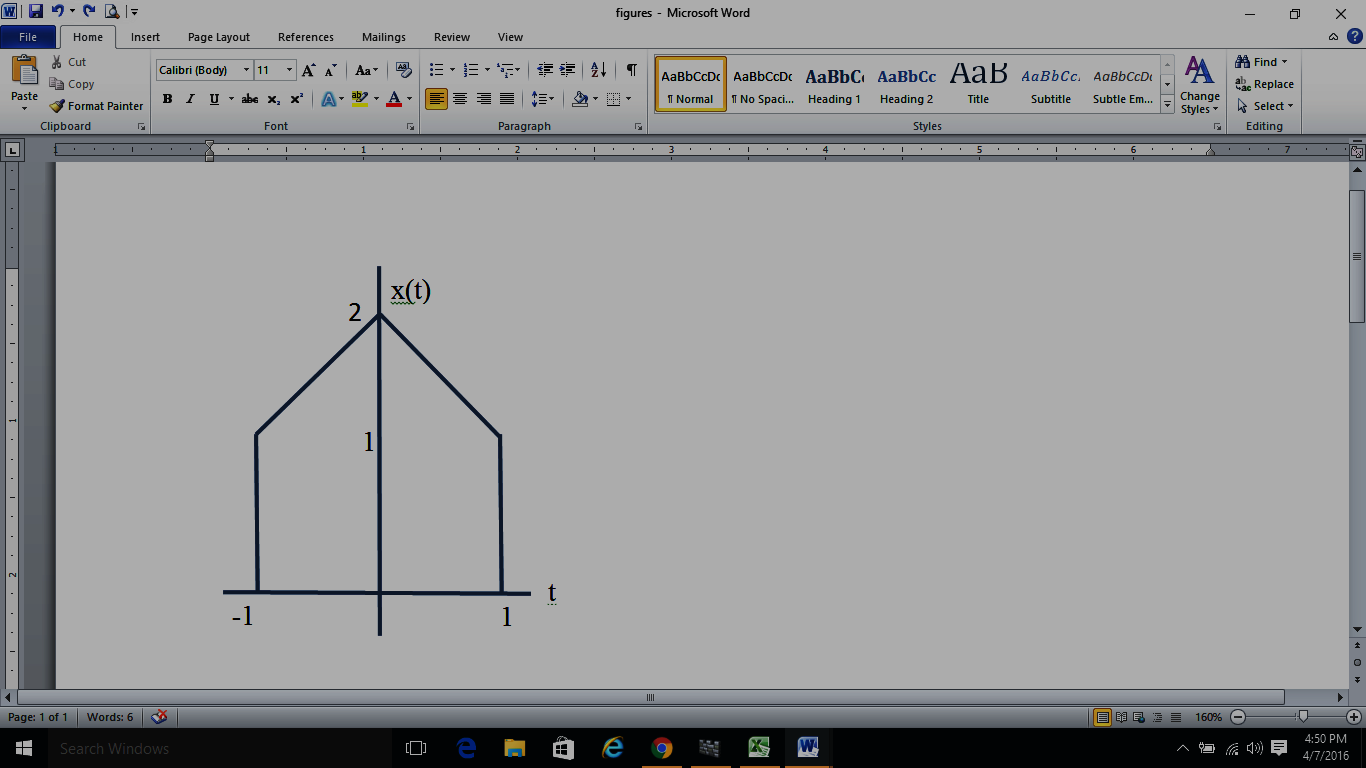
**Signals & Systems**

1. a) Explain about the following signals with the help of examples.

i) Continuous time & discrete time ii) Even & odd

1. Periodic & non-periodic iv) Energy & power

b) For the signal x(t) shown in figure, sketch the following.

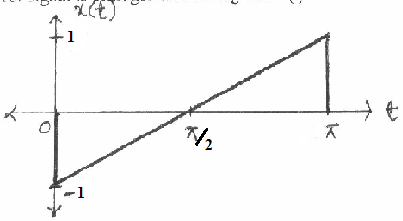
 i) x(t+2) ii) x(3t)

iii) x(2t- 3) iv) x(t/2 -1)

v) x(1- t)

2. a) Explain about Linearity, Time invariance & Causality properties of the following systems. i) y(t) = t.x(t) + x(t-2) ii) y(t) = x2(t) + x(t+2) iii) y(t) = x(t) + x(t-3) iv) y(t) = x(2t) + 3t

b) Approximate the signal x(t) shown in figure, in terms of sin(2t) over the interval [0,]



1. a) Explain any three properties of Fourier & Laplace transforms with suitable examples.

b) Find the zero-input & zero-state response of a LTI system described by differential equation

for the initial conditions **y(0) = 1** , and the input **x(t) = e-4t.u(t)**.

4. a) State and Explain Sampling theorem for band limited signals.

b) Write short notes on

i) Nyquist rate of sampling ii) Effect of under-sampling

iii) Anti-aliasing filter

1. a) Explain any three properties of DTFT & Z- transforms with suitable examples.

b) Realize the LTI system given by Transfer function in

i) Direct form-I ii) Canonic and its transpose

1. a) Determine which of the following signals are Periodic. If periodic find their time period.

i) sin(10t+1) - 2cos(6t-1) iv) cos2 (4t)

1. 3sin(4t) + 2cos(2 t) v) e j4t
2. sin(10 t).u(t)

b) Determine whether the following signals are Energy signals or Power signals.

e-5t .u(t) iv) u(n)

1. 2sin(10 t) v) 5-n .u(n)
2. t2.u(t)

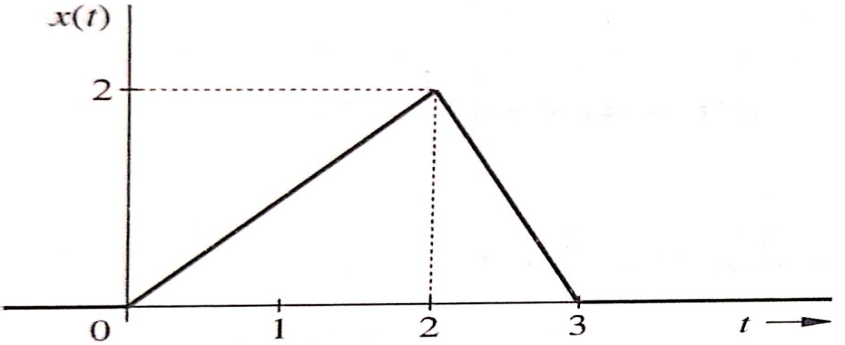
7. a) Find the Compact Trigonometric Fourier Series for the periodic signal x(t) shown in figure, & sketch its Magnitude & Phase spectra.



b) Find the Exponential Fourier Series for the periodic signal x(t) shown in figure, & sketch its Magnitude & Phase spectra.



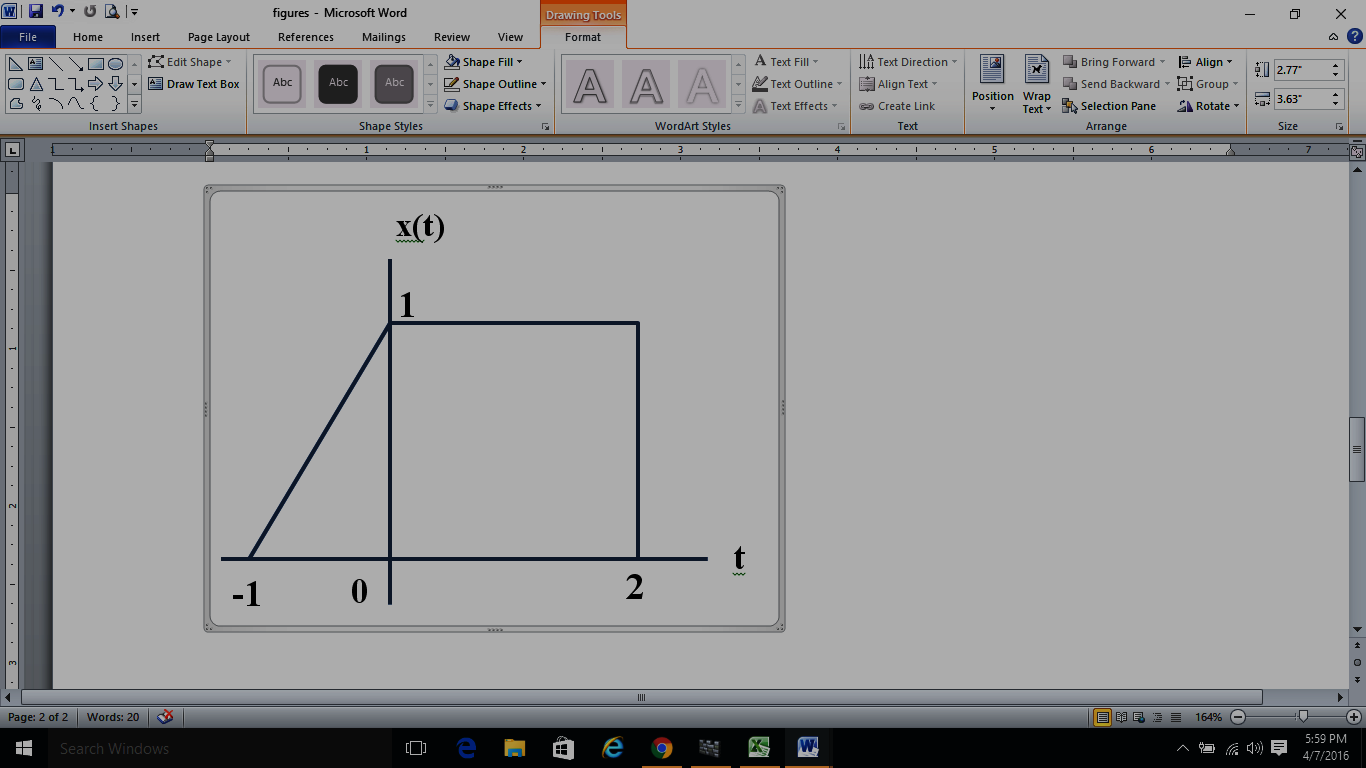
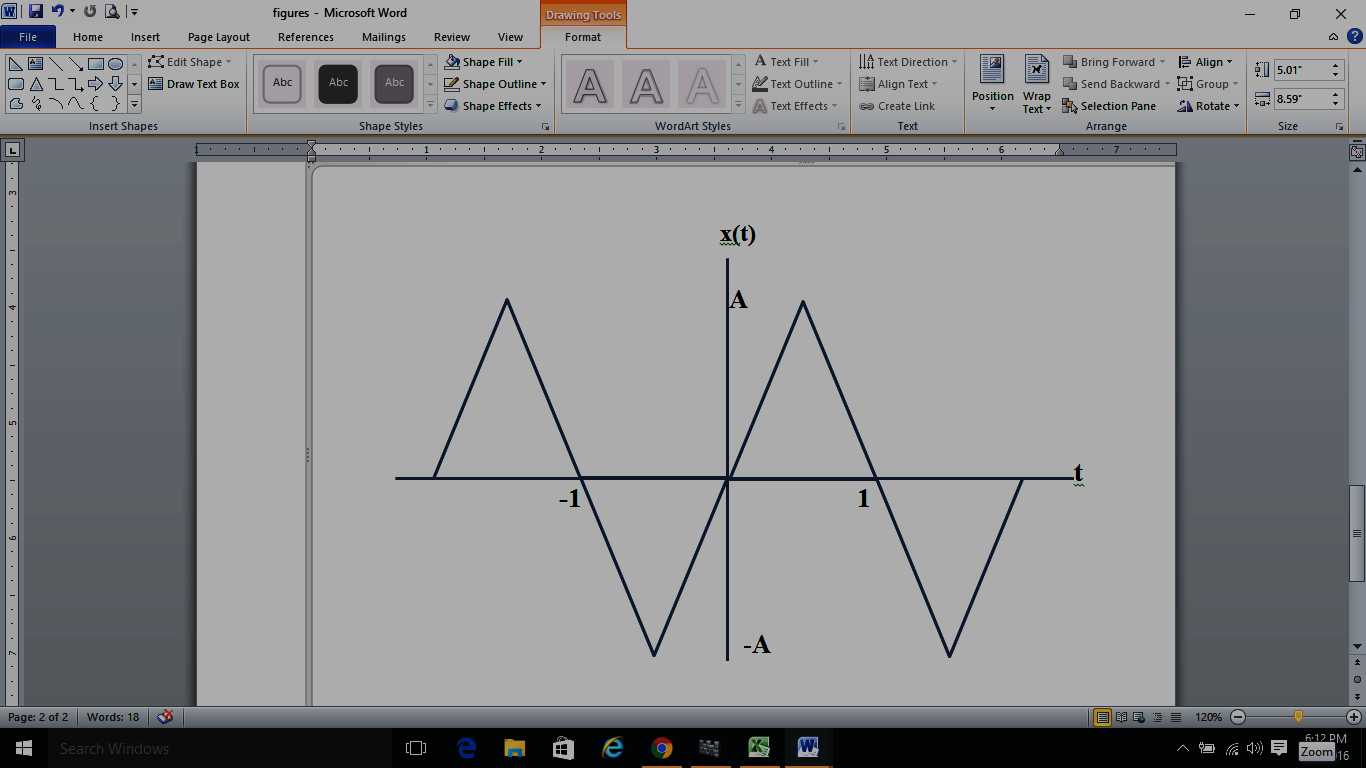
1. a) Find Fourier transform of the signal x(t) shown in figure using time differentiation property.



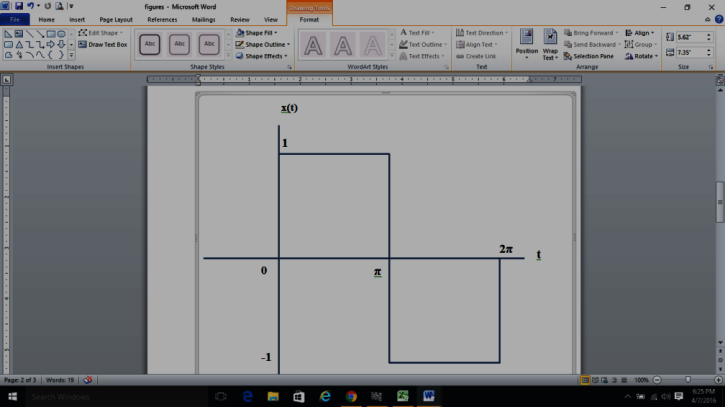
1. Find Inverse Laplace transform of the following. i) ii)
2. a) Find the Nyquist Rate and Nyquist Interval for the following signals.   
   i) x(t) = sinc(100πt)+2 sinc(50πt) ii) x(t) = sinc(80πt). sinc(120πt)

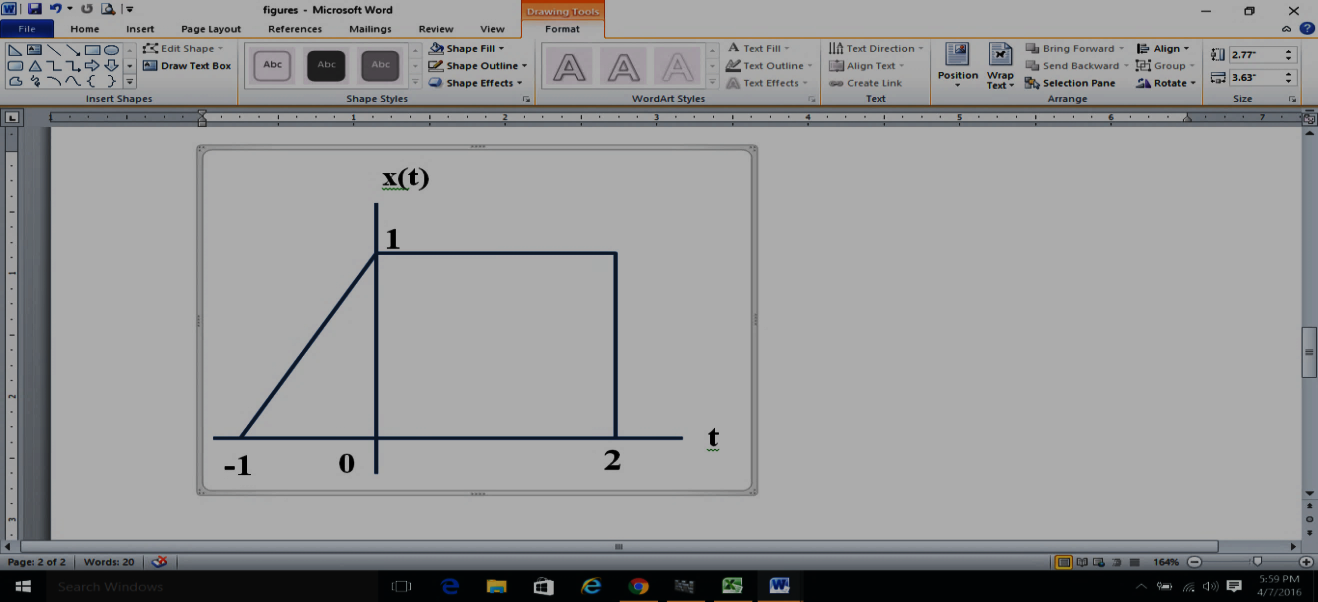
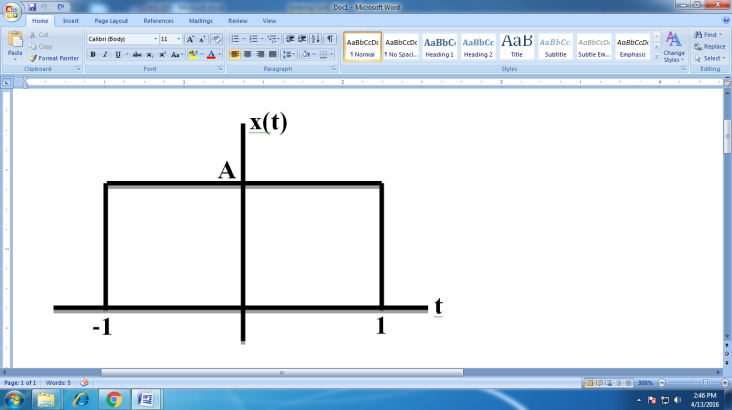
iii) x(t) = -10sin(40πt). cos(300πt)

b) Find the DTFS of **x(n) = sin ()** & plot its magnitude & phase spectra.

1. a) Find x(n) if
2. Find the zero-input & zero-state response of a DT-LTI system given by **y(n) - y(n-1) + y(n-2) = 5 x(n-1) - x(n-2)** to the input **x(n)=u(n)** if the initial conditions **y(-1)=2** , **y(-2)=0**.
3. What are the basic operations on signals?
4. Find the even & odd components of u(t).
5. How do you obtain exponential Fourier series coefficients from trigonometric Fourier series coefficients?
6. Explain the effect of Symmetry on coefficients of Fourier series.
7. Draw the characteristics of ideal filters.
8. Write Initial Value & Final Value theorems of Laplace Transform.
9. When aliasing doesoccur? How can it beavoided?
10. Define and Sketch.
    1. δ(n)
    2. u(n)
11. What is Region of convergence with respect to Z-Transform?
12. Find Z-Transform of n.u(n).
    1. For the signal shown in the figure. Sketch the following
       1. x(t+3)
       2. x(t/2)
       3. x(2 – t)
    2. x(2t – 2)  
         
         
         
         
         
         
         
         
       Check whether the following systems are linear or not
       1. y(t) = t.x(t+2)
       2. y(t) = x(t-2)+ex(t)
13. Find the cosine & trigonometric Fourier Series for the signal x(t) shown in figure and sketch magnitude, phase spectra.   
      
      
      
      
      
      
      
      
      
      
      
    1. Find the Inverse Laplace Transform of X(S)=
    2. Explain any three properties of Fourier Transforms with suitable examples.
14. Solve the second order linear differential equation

for the initial conditions y(0)=2 , and the input x(t)=e-4t.u(t)

* 1. State and Explain sampling theorem for band limited signals.
  2. Find the Nyquist Rate and Nyquist Interval for the signal  
     x(t) = sinc(100πt)+2 sinc(50πt)
  3. Find Z-Transform of the following
     1. cos(n).u(n). ii. 2n. u(n) + 3-n.u(-n-1)
  4. Find inverse Z-Transform by power series method.
     1.  |Z| > 1

1. a. Approximate x(t) shown in figure in terms of sin(t).
2. Find canonic direct realization and its transpose for the Transfer Function
3. Find the even & odd components of the signal u(t).
4. Write the conditions for existence of Fourier series.
5. Find the Fourier Transform of signum(t).
6. Explain the significance of Region of Convergence of Laplace Transform.
7. State Nyquist Sampling theorem.
8. Find the Z- Transform of u(n).
9. State the BIBO stability criterion.
10. Show that the response of an LTI system is the convolution between the applied input & its Impulse response.
    1. For the signal shown in the figure. Sketch the following
       1. x(t+2)
       2. x(t/2)
       3. x(2 – t)
       4. x(2t – 1)
    2. Determine whether the given signal x(t)=sin(2t) + cos(3t) is periodic or not, and if it is periodic determine its period.
    3. Write 3 representations of Fourier series. Derive the relationship between their coefficients.
    4. Sketch the following
       1. u(t–1) ii.δ (t+2) iii. u(t+2)-u(t-2)
    5. For the signal x(t) shown in the Figure. Find the Fourier Transform.
    6. Find the Inverse Laplace Transform of
    7. Determine whether the following discrete time signals are energy signals or power signals.
       1. x(n) =n. u(n)
       2. x(n) = ()n. u(n)
    8. Find the Inverse Z- Transform of
    9. If Z[x(n)] = X(Z), Prove that Z[an. x(n)] = X()
    10. Check whether the following systems are Linear or not.
        1. y(t) = t. x(t+2)
        2. y(t) = x(t-2) + ex(t)
    11. Find the Transfer function and Impulse response of an LTI system described by differential equation

Explain any three properties of Fourier Transform with suitable examples.

1. Define unit impulse, & compute

2) Examine whether the signal x(t) = 2cos(4 t) – 3sin(3 t) is periodic or not. If periodic, find the fundamental time period.

3) Derive relationship between the coefficients of Exponential Fourier series & Trigonometric Fourier series.

4) a) For the signal x(t) shown in Figure 1, sketch the following.

i) x(t+2) ii) x(2t-2) iii) x(1- t) iv) x(t/2 -1)

b) Define discrete time unit step u(n). Sketch u(n+2) - u(n-3) & show that it is an energy signal.

5) a) Show that the system, given by y(t) = x(t+2) + ex(t-1) is non-Linear, Time-invariant & non-Causal.

b) Show that the best approximation of the signal x(t) = t, in terms of sin(t) over an interval of (-,) is 2sin(t). & verify that the error signal e(t) = t - 2sin(t), is orthogonal to sin(t) over the same interval.

6) a) Find the Exponential Fourier series for the periodic signal x(t) shown in Figure 2, & plot its magnitude, phase spectrum.

b) Write about the conditions for existence of Fourier Transform of a signal x(t). Find the Fourier Transform of x(t) = e -3t.u(t)

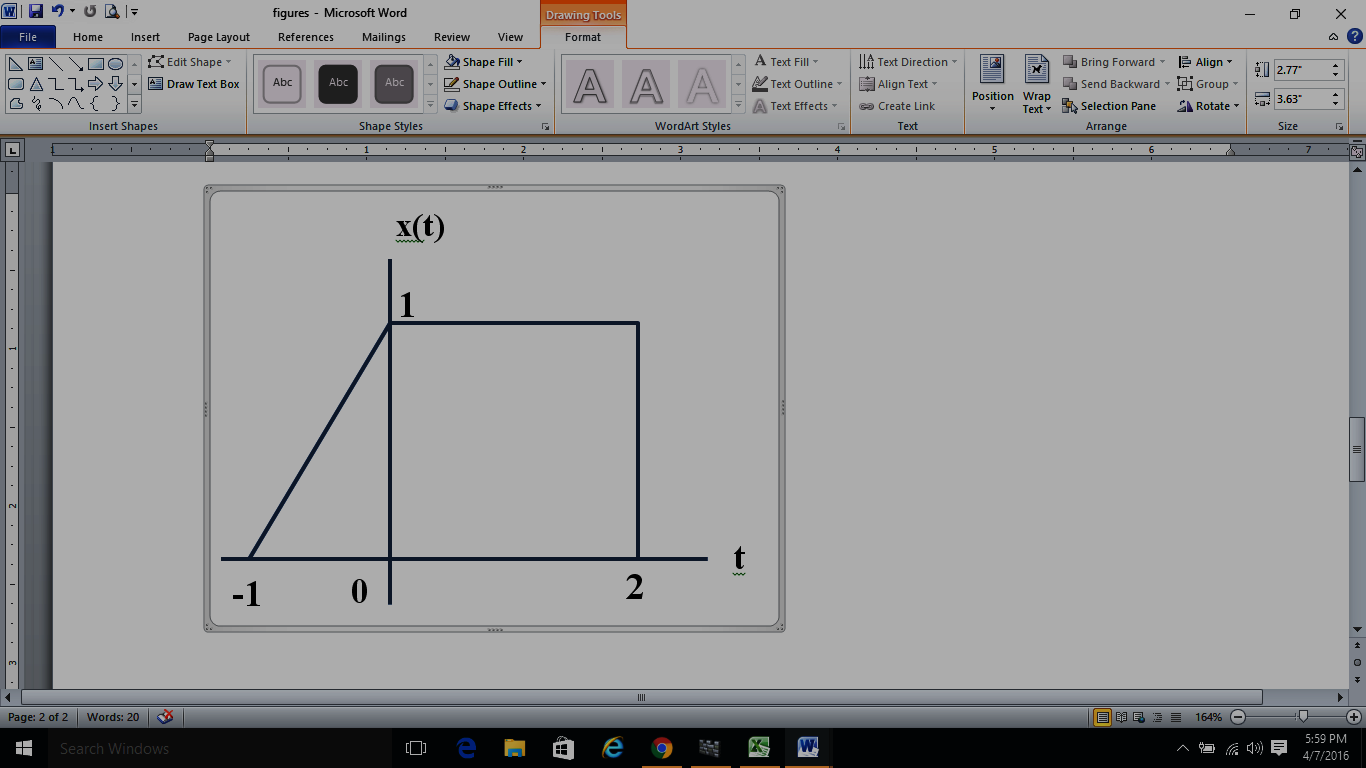
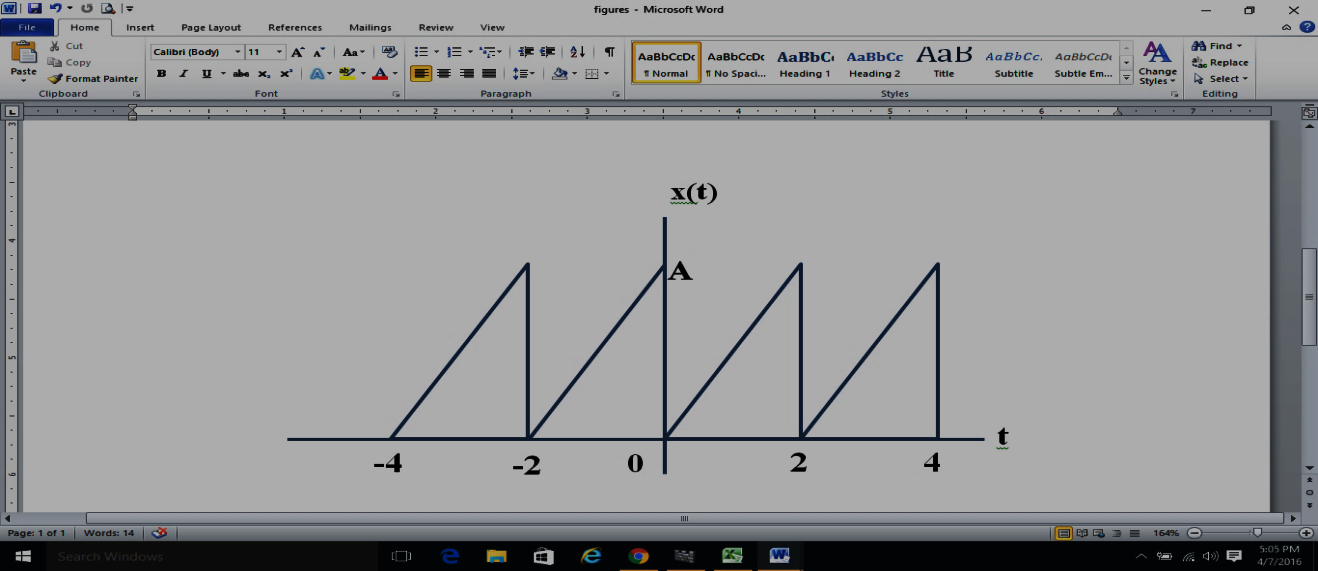


Figure 1 Figure 2

1) Find the signal energy for x(t) = e-4t. u(t) using Parsevals theorem.

2) Explain, when aliasing does occur? How can it be avoided?

3) Determine the initial & final values of the signal x(n) if

4) a) Find Laplace transform of the signal **x(t) = t. e-3t. sin(2t). u(t)** & mention its ROC.

b) Find response y(t) of an LTI system given by

to the input **x(t) = e-4t.u(t)**. The initial conditions are **y(0) = 1** ,

5) a) Find the discrete time Fourier series of signal **x(n) = cos ()**. Plot its magnitude & phase spectra.

b) Find DTFT of **x(n) =** **n. (0.8)n. u(n)**.

6) a) Find Z-Transform of **x(n) =** **n2. u(n)**.

b) Find x(n) for the following ROC conditions if

|Z| > 3 ii) |Z| < 1 iii) 1 < |Z| < 2 iv) 2 < |Z| < 3