# GANPAT UNIVERSITY

## B. TECH. SEMESTER IV (ELECTRONICS & COMMUNICATION ENGINEERING)
## REGULAR EXAMINATION, MAY-JUNE 2012

# 2EC401-SIGNALS AND SYSTEMS

**[Max. Time: 3 Hrs.]** **[Max. Marks: 70]**

**Instructions:**

1. Attempt all questions.
2. Answers to the two sections must be written in separate answer books.
3. Figures to the right indicate full marks.
4. Assume suitable data, if necessary.

## SECTION-I

**Que.-1** **(A)** Define the unit parabolic function and unit impulse function. Give their relationship with different elementary signal. 6

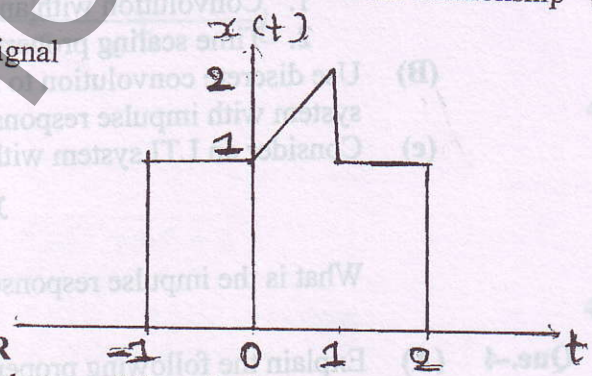
**(B)** For the signal x(t) shown in fig.1 , find the signal 6

(1). $x(2t+2)$ & $x(0.5t-2)$

(2). $x(5t/3)$ & $x(3t/5)$

(3). $x(-t+2)$ & $x(-t-2)$

Fig-1




OR

**Que.-1** **(A)** Let $x_1(t)$ & $x_2(t)$ is periodic signal. Under what conditions is the sum $x(t)=x_1(t)+x_2(t)$ periodic and what is the fundamental periodic of x(t) if it is periodic? 3

**(B)** Determine the values of $P_x$ & $E_x$ for the following signal. 6

(1) $x(t)=e^{j(2t+\frac{\pi}{4})}$

(2) $x(n)=\cos(\frac{\pi}{4}n)$

**(c)** Define causal and noncausal signal with example. 3

**Que.- 2** **(A)** y(t)=tx(t), for given system determine whether system is 5

(1) linear (2) time-invariant (3) causal (4) Memory

**(B)** State and prove the time shifting and frequency shifting properties for Discrete time Fourier transform 6

OR

**Que.-2** **(A)** Find the Fourier transform of the CT Signal $x(t)=e^{-at}u(t), \quad a>0$ 6

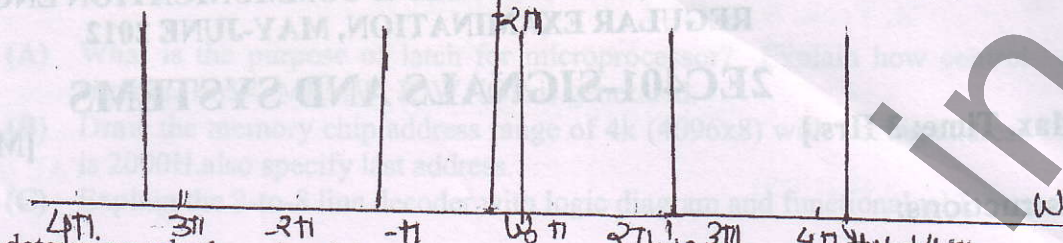
Plot the magnitude & Phase spectrum of x(t).

**(B)** Prove the Convolution Property for continuous-time Fourier transform. 3

**(C)** Define the convergence of FT. 2

**Que.-3** **(A)** Find the inverse Fourier transform of
$x(e^{j\omega}) = \sum_{m=-\infty}^{\infty} 2\pi\delta(\omega - \omega_0 - 2\pi m)$, which is shown in below fig(2). 6

Fg. 2




**(B)** determine whether signal is periodic, if it is, then find its fundamental period of the following signal 4

(1) $x(n)= \cos(\frac{\pi}{8}n^2)$

(2) $x(t)=2\cos(10t+1) - \sin(4t-1)$

**(c)** Define Memory and Memoryless systems with example 2

## SECTION-II

**Que.-4** **(A)** Explain following properties of convolution Integral 4

1. Convolution with an impulse
2. Time scaling property

**(B)** Use discrete convolution to find the response to the input $x(n) = a^n u(n)$ of the LTI system with impulse response $h(n)= b^n u(n)$. Use graphical method. 5

**(c)** Consider an LTI system with input and output related through the following relationship 3

$$y(t) = \int_{-\infty}^{t} e^{-(t-\tau)} x(\tau - 2)\, d\tau$$

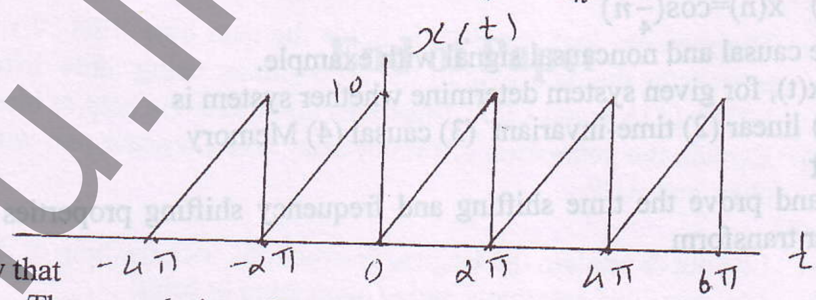
What is the impulse response h(t) for this system?

**OR**

**Que.-4** **(A)** Explain the following properties of Z-transform 4

1. Time shifting
2. Convolution of two sequences

**(B)** Find the exponential Fourier series for the periodic waveform shown in fig(3) using this coefficients of exponential series obtain $a_n$ and $b_n$ 5




fig(3)

**(c)** Show that 3

1. The convolution of an odd and an even function is an odd function
2. The convolution of two even function is an even function

**Que.-5** **(A)** Explain following properties of continuous time Fourier series 6

1. Time scaling
2. Periodic convolution
3. Time reversal

**(B)** Find the inverse Z-transform of following using partial fraction expansion method **5**

$$X(Z) = \frac{1-\frac{1}{2}Z^{-1}}{1-\frac{3}{4}Z^{-1}+\frac{1}{8}Z^{-2}} \qquad |z| > 1/2$$

**OR**

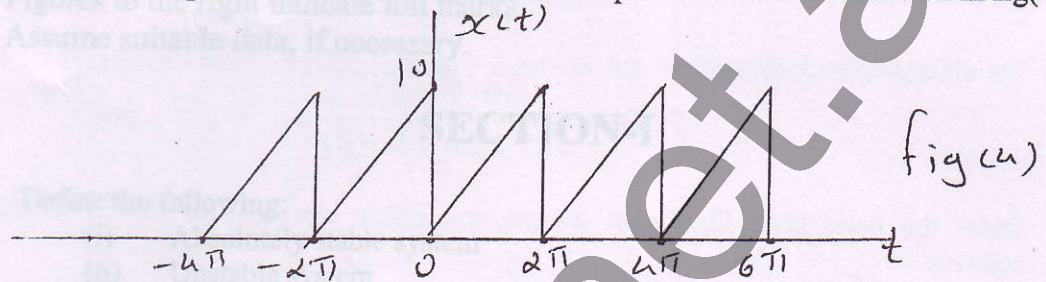
**Que.-5** **(A)** The transfer function of a causal LTI system is **6**

$$H(Z) = \frac{1-Z^{-1}}{1+\frac{3}{4}Z^{-1}}$$

*1.* find the impulse response of the system

*2.* find the output of the system to the input $x(n)=\frac{1}{3}^{n}u(n)-u(-n-1)$

**(B)** Find the trigonometric Fourier series for the periodic waveform shown in fig(4) **5**




**Que.-6** **(A)** Let x(t) = [u(t-3)-u(t-5)] and h(t)= $e^{-3t}$u(t) **4**

1. compute y(t)=x(t)*h(t)
2. compute g(t)= $\frac{d}{dt}$x(t)* h(t)

**(B)** Find the Z-transform of following signals **4**

1. x(n) = $a^{n}$u(-n-1)
2. x(n) = $(\frac{1}{2})^{n}$[u(n-5)-u(n-10)]

**(c)** Explain the stability and causality condition for the LTI system **4**

## End of Paper