Exam No: _____

GANPAT UNIVERSITY
B. TECH SEM- VI (ELECTRICAL)
REGULAR EXAMINATION– APRIL-JUNE 2017
2EE607: Signals & Systems

Time: 3 Hrs **TOTAL MARKS: 60**

Instructions: (1) This Question paper has two sections. Attempt each section in separate answer book.
(2) Figures on right indicate marks.
(3) Be precise and to the point in answering the descriptive questions.

SECTION I

Q.1

(A) Signal $X(n) = \{1, 3, 5, 7, \underset{\uparrow}{0}, 2, 4, 6, 8, \}$ [04]

Find

(1) $X(2n+1)$

(2) $X(n-3)$

(3) $X(-n+1)$

(4) $X(-n-2)$

(5) $X(\frac{n}{2})$

(B) Test the periodicity of given signal. [04]

$$x(n) = 4\sin\frac{2\pi t}{3} + 3\sin\frac{2\pi t}{7}$$

(C) Define following function graphically and mathematically. [02]

(1) Exponentially rising sinusoidal signal

(2) Sinc signal

(3) Signum signal

OR

Q.1

(A) Draw the examples of (i) Continuous & Discrete-time signal, (ii) Periodic & Aperiodic signal and (iii) Even & Odd signal. [04]

(B) Explain the time scaling, folding and time shifting operations of a discrete-time signal with examples. [04]

(C) Prove that power of the energy signal is zero. [02]

Q.2

(A) Test linearity, time dependency and causality of following systems [05]

(1) $y(n) = a\,x(n) + c$

(2) $y(n) = x(n^2)$

(B) Solve the second order differential equation [05]

$$y[n] - \frac{3}{2}y[n-1] + \frac{1}{2}y[n-2] = 1 + 3^{-n}\ ;$$

$$n \geq 0 \text{ with initial condiation } y[-2] = 0 \text{ and } y[-1] = 2$$

OR

Q.2

(A) Find the convolution of two signal by mathematical method. [05]

$$x_1(n) = \{1, \underset{\uparrow}{2}, -1, 3\}, x_2(n) = \{1, 1, 1, 1\}$$

(B) Check the following systems are linear or not, time dependent or not. [05]

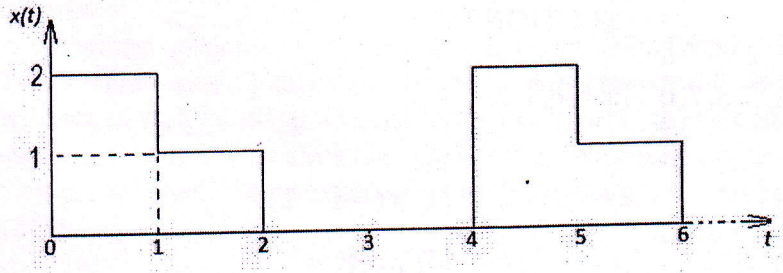
(1) $y(t) = t\,x(t)$

(2) $y(t) = x(t^3)$

(3) $y(t) = e^{x(t)}$

Q.3 **Attempt following questions.**

(A) Find exponential Fourier series for waveform given below : [06]



(B) Draw the following signal : [02]

$u(t) - [u(t+1) - u(t-1)]$

(C) Perform convolution using matrix method. [02]

$$x(n) = \{1, 0, 1\}, \quad h(n) = \{1, 1, -1\}$$

SECTION II

Q.4

(A) Define continuous time fourier transform (CTFT), and discuss time scaling and multiplication property. [05]

(B) Stable LTI system that is characterized by differential equation [05]

$$\frac{d^2y(t)}{dt^2} + 4\frac{dy(t)}{dt} + 3\,y(t) = \frac{dx(t)}{dt} + 2\,x(t)$$

Find the impulse response of the system using CTFT.

OR

Q.4

(A) Find the output response of the of an LTI system using CTFT with impulse response [05]

$h(t) = e^{-at}\,u(t), a > 0$ to the input

$x(t) = e^{-bt}\,u(t), b > 0$

(B) Find the output response of the system using CTFT whose frequency response is given by [05]

$$H(j\omega) = \frac{j\omega + 2}{(j\omega + 1)(j\omega + 3)}$$

With input signal $x(t) = e^{-t}u(t)$

Q.5

(A) Prove the convolution in time domain is multiplication in frequency domain [05]

using DTFT (Discrete Time Fourier Transform)

(B) Define DTFT. Find DTFT of the following signals [05]

(1) $x(n) = \{1, 2, 3, \underset{\uparrow}{4}, 3, 2, 1\}$

(2) $x(n) = \begin{cases} 1 ; n \geq 0 \\ 0 ; n < 0 \end{cases}$

OR

Q.5

(A) Discuss the following properties of DTFT [05]

(1) Time shifting

(2) Time expansion

(3) Differentiation

(B) A causal LTI system that is characterized by the differential equation [05]

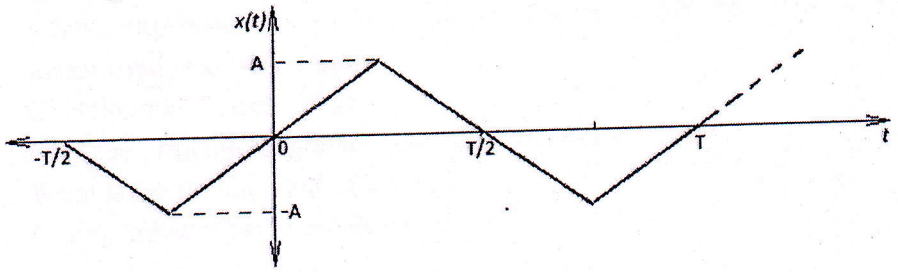
$$y[n] - \frac{3}{4}\, y[n-1] + \frac{1}{8}\, y[n-2] = 2\, x[n]$$

(1) what is the impulse response using DTFT.

(2) If the input to this system is $x[n] = (\frac{1}{4})^n\, u[n]$, what is the system response to the input signal?

Q.6 **Attempt following questions.**

(A) Find the trigonometric Fourier series expansion for the waveform given below : [06]



(B) Compare : CTFT with DTFT [04]

END OF PAPER