

# GANPAT UNIVERSITY

B. Tech. Sem. IV (EC)

Regular Examination May-June 2013

## 2EC401: Signals and Systems

Time: 3 Hours

Total Marks: 70

### Instructions:

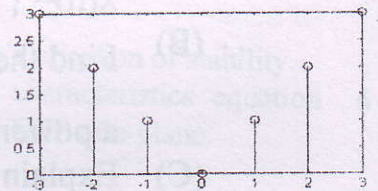
1. Attempt all questions.
2. Answers to the two sections must be written in separate answer books.
3. Figures to the right indicate full marks.
4. Assume suitable data, if necessary.

### SECTION-I

- 1 (A) Find the odd and even component of the given signal 6  
(i)  $x(t) = e^{-2t} \cos t$  (ii)  $x(t) = tu(t)$   
(B) Determine whether signal is periodic, if it is, then find its fundamental period 6  
of the following signal. (i)  $x(n) = \cos\left(\frac{\pi}{8}n^2\right)$  (ii)  $x(t) = 2e^{j\left(t+\frac{\pi}{4}\right)}u(t)$

### OR

- 1 (A) Determine the values of  $P_x$  &  $E_x$  for the following signal.  $x(t) = A \sin(\omega_0 t + \phi)$  4  
(B) Define Stable system. Determine whether the given system  $y(t) = tx(t)$  is stable 4  
or not?  
(C) Draw the following Signals. (i)  $u(t) - 2u(t-1) + u(t-2)$  (ii)  $x(t) = \delta(\cos t)$  4
- 2 (A) Define the unit step function and unit impulse function. Give their relationship 5  
with different elementary signal.  
(B) A continuous time signal  $x(t)$  is shown in figure(a). 6  
Sketch and label  
(i)  $x(t) \cdot u(1-t)$   
(ii)  $x(t) \cdot [u(t) - u(t-1)]$   
(iii)  $x(t) \cdot \delta(t-3/2)$



Figure(a)

### OR

- 2 (A)  $X(n) = a^n u(-n-1)$ ,  $|a| > 1$ , find the Fourier transform and Plot the 6  
magnitude & Phase spectrum of  $X(n)$ .  
(B) Explain the Fourier Transform For Periodic Signals. 5
- 3 (A) Prove the  $P_\infty = \lim_{T \rightarrow \infty} \frac{E_\infty}{2T} = 0$ . 3  
(B)  $y(n) = x(n^2)$ , for given system determine whether system is 6  
(i) linear (ii) time invariant (iii) Memory (iv) causal  
(C) State and Prove the Time-shifting for CTFT. 3

## SECTION-II

- 4 (A) Find the convolution  $y(t)=x(t)*h(t)$  of following signal,  $x(t)=tu(t)$ ;  $h(t)=u(t)$ . 3  
(B) Prove that the area of the convolution integral is equal to the product of the 4  
two signals entering into the convolution.  
(C) Explain causality and stability of LTI Systems. 5

OR

- 4 (A) Show that 6  
(i) The convolution of an odd and even function is an odd function.  
(ii) The convolution of two odd functions is an even function.  
(iii) The convolution of two even functions is an even function.  
(B) Evaluate the convolution sum for a system with input  $x(n)$  and impulse 6  
response  $h(n)$ , respectively, given by  $x(n) = h(n) = [u(n+N) - u(n-N-1)]$ .

- 5 (A) Determine the Z-transform and ROC of the following finite duration signal 2  
 $x(n) = \{1, 2, 6, -2, 0, 3\}$

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- (B) Determine the Z-transform and ROC of the signal  $x(n) = u(n) - u(n-10)$ . 3  
(C) Explain and prove following property of Z-Transform 6  
(i) Time shifting (ii) Time reversal (iii) Convolution property

OR

- 5 (A) Determine the Z-transform of unit impulse function and unit step function. 4  
(B) What is meaning of Region of Convergence for Z-transform. List the all 7  
properties of ROC.

- 6 (A) Determine the output response  $y(n)$  using graphical method 4  
 $x(n) = \{1, 2, 3, 2\}$ ;  $h(n) = \{1, 2, 2\}$ .

- (B) Find the inverse Z-transform of  $H(Z) = \frac{1+Z^{-1}}{1-(\frac{1}{3})Z^{-1}}$ ; when ROC:  $|Z| > \frac{1}{3}$  using 4  
a power series expansion.

- (C) Explain and prove the following properties of convolution integral 4  
(i) Distributive property  
(ii) Shift property

END OF PAPER