GANPAT UNIVERSITY

B. Tech. Sem. IV (EC) Engineering
Regular Examination May 2014
## 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 convolution of the two continuous-time signals $x(t) = e^{-|t|}$, for all 6
t and $h(t) = \begin{cases} e^{-2t}, & t \geq 1 \\ 0, & t < 1 \end{cases}$

(B) Determine the output response y(n) = x(n) * h(n) using graphical method 6
and matrix method , x(n)= { 1, 2, 3, 2}; h(n)={ 1, 2, 2}

OR

1 (A) Explain and prove the following properties of convolution integral 6
(i) Distributive property   (ii) Shift property   (iii) Time-scaling property

(B) Determine the output response y(n) = x(n) * h(n) of following signals 6
(i) x(n)=u(n); h(n)= 2n u(n);   (ii) x(n)=u(n); h(n)= u(n-3);

2 (A) Determine the Z-transform of $x(n) = -\left(\frac{1}{2}\right)^n u(-n-1) + 2^n u(-n-1)$ 5
and depict the ROC and the locations of poles and zeros in the z-plane.

(B) Determine the z-transform and ROC of 6
(i) x(n) = δ(n)   (ii) x(n) = u(n)   (iii) x(n) = -u(-n-1)   (iv) x(n) = u(-n)

OR

2 (A) Determine the Z-transform of the causal signal $x(n) = a^n u(n)$ and depict 5
the ROC and the locations of poles and zeros in the z-plane.

(B) Determine the z-transform of following signals 6
(i) x(n) =sin(ω_0n) u(n)   (ii) x(n) =cos(ω_0n) u(n)

3 (A) What is meaning of Region of Convergence for Z-transform. List the all 6
properties of ROC for Z-transform.

(B) Find the exponential Fourier Series for the waveform shown in figure(a). 6
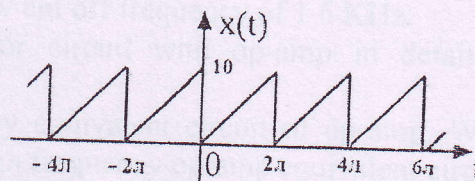
Figure(a)

SECTION-II

4 (A) Define Impulse signal in continuous and discrete time signal. State and prove any two properties of Impulse function   **6**

  (B) Find the even and odd components of the following signals   **6**
(i) $x(n)=\{-3,1,2,-4,2\}$
(ii) $x(t) = u(t + 4) - u(t - 2)$

OR

4 (A) A continuous time signal x(t) is shown in fig.(b), Sketch and label following signals   **6**
(i) x(t+2)
(ii) $x(\frac{3}{2}t + 3)$
(iii) x(-t-1)
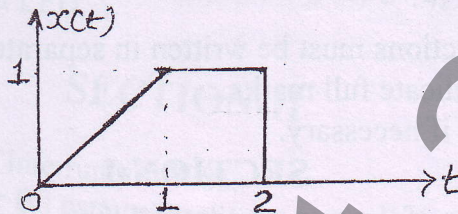
  (B) Determine whether the following signals are power or energy signals or neither.   **6**
(i) x(t)=A sin(t), $-\infty < t < \infty$
(ii) $x(t) = e^{-a|t|}$, a > 0

5 (A) Define the continuous time signal $x(t) = e^{-a|t|}$, a > 0. Also fine its Fourier transform.   **5**

  (B) State and Prove the Time-shifting and Time Scaling Property for CTFT.   **6**

OR

5 (A) Determine the Fourier transform of the unit impulse x(t) = δ(t).   **2**

  (B) Find the inverse Fourier transform of $X(\omega) = \delta(\omega - \omega_0)$.   **3**

  (C) Explain and prove the following properties of Fourier transform   **6**
(i) Convolution property
(ii) Multiplication property

6 (A) Determine whether signal is periodic, if it is, then find its fundamental period of the following signal   **6**

(i) $x(n) = 3e^{\frac{j3\pi\left(n+\frac{1}{2}\right)}{5}}$

(ii) $x(t) = e^{t(-1+j)}$

  (B) Find the Fourier transform of $x(n) = a^n u(n)$, $|a| < 1$ and plot the magnitude and phase spectrum of x(n).   **6**

END OF PAPER