GANPAT UNIVERSITY

B. Tech. Semester IV (EC)Engineering

CBCS Regular Examination April - June 2015

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) Evaluate the convolution integral for a system with input x(t) and impulse response h(t), respectively, given by x(t) = h(t) = [u(t+T) – u(t-T)] **6**

(B) Find the convolution of the sequences y(n) = x(n) * h(n) using graphical method and matrix method. $x(n) = \{1, \underset{\uparrow}{2}, 3, 1\}$ and $h(n) = \{2, \underset{\uparrow}{1}, 2, 1\}$ **6**

OR

1 (A) Prove the following properties of convolution integral **6**
(i)Commutative (ii)Distributive (iii)Convolution with impulse

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

2 (A) Determine the z-transform and ROC of the following finite-duration signals **3**
(i) $x(n) = \{1, 2, 6, -2, 0, 3\}$ (ii) $x(n) = \{1, 2, \underset{\uparrow}{6}, -2, 0, 3\}$

(B) Explain and prove following property of Z-Transform **4**
(i) Linearity (ii) Time Shifting

(C) Determine the z-transform and ROC of (i) x(n) = -u(-n-1) ; (ii) x(n) – u(-n) **4**

OR

2 (A) Determine the z-transform and ROC of (i) x(n) =δ(n-k) (ii) x(n) = u(n) **3**

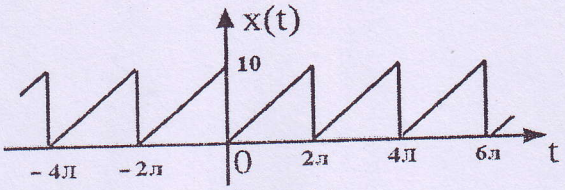
(B) Explain and prove following property of Z-Transform **4**
(i) Scaling in z-Domain (ii) Time Reversal

(C) Determine the Z-transform of x(n) = $-\left(\frac{1}{2}\right)^n u(-n-1)$ and depict the ROC and the locations of poles and zeros in the z-plane. **4**

3 (A) Show that the convolution of two odd functions is an even function. **2**

(B) Find the inverse Z-transform using a power series expansion of $X(z) = \frac{z}{z-0.5}$; when ROC: |Z| > 0.5 **5**

(C) Find the trigonometric Fourier Series for the waveform shown in figure (a). **5**



Figure(a)

SECTION-II

4 (A) Write mathematical modeling of Impulse function in CTS and DTS. State and prove any three properties of impulse function. 6

(B) Define Stable system. Determine whether the given system y(t)=tx(t) is stable or not ? 4

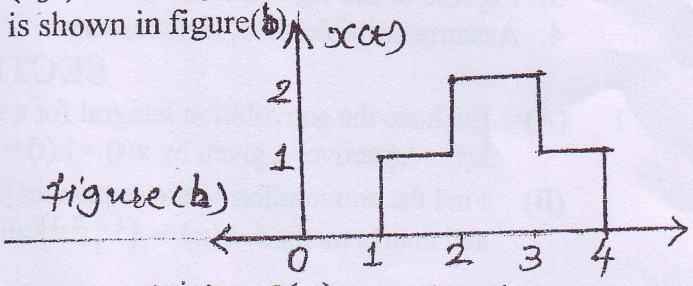
(C) Define the sampling function. 2

OR

4 (A) Determine whether signal is periodic, if it is, then find its fundamental period of the following signal.(i) x(n)= $\sin\left(\frac{2\pi n}{3}\right) + \cos\left(\frac{2\pi n}{5}\right)$ (ii) x(t)=$3e^{j\frac{3}{5}\left(n+\frac{\pi}{4}\right)}$ 6

(B) A continuous time signal x(t) is shown in figure(b) 6

(1) x(2t+3)
(2) x(t/2)
(3) x(-2t+1)



figure(b)

5 (A) Sketch and Find the inverse DTFT of $x(e^{j\omega}) = \delta(\omega),\ -\pi < \omega < \pi$ 5

(B) Find the Fourier transform of $x(t) = \cos\omega_0 t$, draw the magnitude and phase spectrum 2

(C) Define the Dirichelet Condition for CTFT

OR

5 (A) Find the Fourier transform of the 6

(i) $x(n) = \delta(n+2) - \delta(n-2)$
(ii) $x(n) = \{1, -1, 2, 2\}$

(B) $y(n) = 3x(n) + 4$, Prove the given system is 5

(i) linear or non-linear (ii) Memory or Memory-less (ii) Causal or non-causal

6 (A) Determine whether signal is energy signals or Power signal, calculate their energy or power of given signals 6

(i) $x(n) = e^{j\left(\left(\frac{\pi}{2}\right)n+\frac{\pi}{8}\right)}$ (ii) $x(t) = tu(t)$

(B) Find the Fourier transform and Plot the magnitude & Phase spectrum of $x(t) = e^{-at}u(t), a > 0$

END OF PAPER