

GANPAT UNIVERSITY

B. Tech. Semester: IV (EC) Engineering

Regular Examination April – June 2016

2EC401: Signals & Systems

Time: 3 Hours

Total Marks: 60

Instruction:

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) Write and prove the following properties of convolution integral 6
 (i) Commutative (ii) Associative (iii) Time shifting
 (B) Compute the convolution $y(n) = x(n) * h(n)$ of following pairs of signals 4
 (i) $x(n) = h(n) = u(n)$; (ii) $x(n) = (0.8)^n u(n)$; $h(n) = (0.4)^n u(n)$

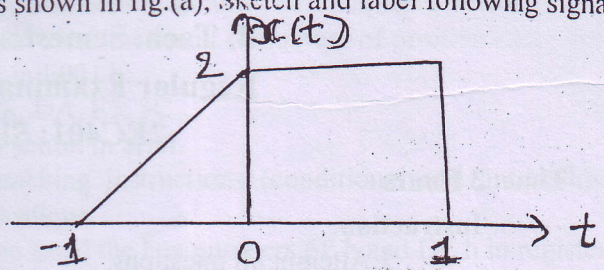
OR

- 1 (A) Do as directed. 6
 (i) Show that the convolution of odd and even function is an odd function.
 (ii) Prove the following convolution integral $x(t) * \delta(t - t_0) = x(t - t_0)$.
 (iii) Prove the following convolution integral $u(t) * u(t) = r(t)$
 (B) Write the following properties of convolution sum 4
 (i) Commutative (ii) Associative (iii) Distributive (iv) Time shifting
 2 (A) List the all properties of Region of Convergence for Z-transform. 5
 (B) Evaluate the inverse Z-transform using a power series expansion of 5
 $X(z) = \frac{1+z^{-1}}{1-(\frac{1}{3})z^{-1}}$; when (i) ROC: $|z| < \frac{1}{3}$ and (ii) ROC: $|z| > \frac{1}{3}$

OR

- 2 (A) Determine the z-transform and ROC of following 4
 (i) $x(n) = -a^n u(-n-1)$ (ii) $x(n) = \{1, 2, 6, -2, 0, 3\}$
 (B) Write and prove following properties of Z-transforms. 6
 (i) Time shifting (ii) Scaling in Z domain (iii) Convolution
 3 (A) Explain following relationship between LTI system properties and impulse response 4
 (i) LTI systems with and without memory
 (ii) Causality for LTI systems
 (B) Find the DTFT of $x(n) = a^n u(n)$, $|a| < 1$ 2
 (C) Write and prove following properties of DTFT. 4
 (i) Time shifting (ii) Time Reversal

SECTION-II

- 4 (A) A continuous time signal $x(t)$ is shown in fig.(a), Sketch and label following signals 5
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- (i) $x(2t-2)$ & $x(2t+1)$
(ii) $x(t+2)$ & $x(-2t+2)$
(ii) $x(2t/3)$ & $x(3t/5)$
- (B) Discuss continuous Exponential signals and Discrete Exponential signals with example. 3
- (C) Find the even and odd part of $x(t) = e^{-2tj}$ signal. 2
- OR
- 4 (A) Sketch and label the following signals. 4
- (i) $x(t) = u(t) - 2u(t-1) + u(t-2)$
(ii) $y(t) = r(t) - r(t-1)$
- (B) Define the unit impulse function and unit step function. Give their relationship with different elementary signal. 4
- (C) Find the even and odd part of $x(n) = \{3, 4, 1, -1, 2, 6, \}$ signal. 2
- 5 (A) $y(n) = 4x(n) - 5$ for given system determine whether system is 5
- (i) linear (ii) time-invariant (iii) causal (iv) memory
- (B) Find the Fourier transform of $x(t) = e^{-at}u(t)$, $a > 0$ and plot the magnitude And phase spectrum of $x(t)$. 5
- OR
- 5 (A) Find the Fourier transform of $x(t) = \cos(\omega_0 t)$ 3
- (B) State and prove the following properties of continuous time Fourier series 5
- (i) time scaling (ii) frequency shifting
- (C) Find the inverse continuous time Fourier transform of $X(\omega) = \delta(\omega - \omega_0)$ 2
- 6 (A) If given signals are periodic, then find their fundamental Period 5
- (i) $x(n) = \cos(\frac{\pi}{8}n^2)$
(ii) $x(t) = 2 \cos(20\pi t) + \sin 10\pi t$
- (B) Define Inevitability and inverse system 2
- (C) Find the power and energy of unit ramp signal. 3

END OF PAPER