



Indian Institute of Information Technology Allahabad
Department of Electronics and Communication Engineering
Digital Signal Processing 2022-2022



Date: 25/02/2022

C1-Review Test

Max. Marks: 25*

10:00 AM –12.00 PM

Notes to the students:

1. Students must show all the steps while solving the questions. No marks shall be awarded for writing direct answer without showing all the necessary steps.

Submission Instructions: Answer each question. **Write your name, ID Number on the first page** of your answer sheet. Once your hand-written responses are prepared, scan the solution and convert it to a PDF file. **Name the PDF file by your ID Number only** and submit it through Google classroom. Please adhere to the submission deadline, as announced and also mention answer and page numbers properly.

- Q.1.** a. Draw the waveform of the given signal: $x(t) = u(t) - 2u(t-1) + u(t-2)$.
 b. Determine whether the given signal is periodic: $x(n) = \sum_{k=-\infty}^{\infty} [\delta(n-4k) - \delta(n-1-4k)]$
 c. Consider the continuous-time signal $x(t) = \delta(t+2) - \delta(t-2)$.
 Calculate the value of E_y (Energy) for the following signal: $y(t) = \int_{-\infty}^t x(\tau) d\tau$
 d. Find the even and odd components of the signal $x(t) = e^{-2t} \cos(t)$
 e. Determine the values of power and energy of the given signal: $x(n) = \cos(\frac{\pi}{4} n)$
- Q.2.** Check the following system using (i) static, (ii) stable, (iii) causal, (iv) linear or (v) time-invariant of the given signal: $y(t) = \begin{cases} 0, & t < 0 \\ x(t) + x(t-2), & t \geq 0 \end{cases}$
- Q.3.** a. Find the convolution of the two continuous-time signals $x(t) = 3\cos(2t)$, for all t and $h(t) = e^{-|t|} = \begin{cases} e^t, & t < 0 \\ e^{-t}, & t \geq 0 \end{cases}$
 b. Find the autocorrelation function $R_{xx}(\tau)$ of the sine wave signal $x(t) = A \sin(w_0 t + \phi)$, $w_0 = \frac{2\pi}{T}$
- Q.4.** Consider the signal $x(n) = \alpha^n u(n)$
 a. Determine the signal $g(n) = x(n) - \alpha x(n-1)$.
 b. Use the result of part (a) in conjugation with properties of convolution in order to determine a sequence $h(n)$ such that $x(n) \otimes h(n) = (\frac{1}{2})^n [u(n+2) - u(n-2)]$.
- Q.5.** a. Let $x(n)$ be a periodic signal with period $N = 8$ and Fourier series coefficients $X_k = -X_{k-4}$. A signal $y(n) = (\frac{1+(-1)^n}{2})x(n-1)$ with period $N = 8$ is generated. Denoting the Fourier series coefficients of $y(n)$ by Y_k , find a function such that $Y_k = f(k)X_k$
 b. Let $x(n)$ denote a causal, complex-valued sequence with Fourier transform $X(e^{jw}) = X_R(e^{jw}) + jX_I(e^{jw})$. If $X_R(e^{jw}) = 1 + \cos(w) + \sin(w) - \sin(2w)$, determine $X_I(e^{jw})$

***** Please make sure that your answers should not be plagiarized from any source and should be based on your own learning/research from the course *****

|||||||Wish you all the best for your exam|||||||

"Do the best you can until you know better. Then when you know better, do better."
