



Important instructions:

- Read the questions. Attempt Question 3 at the end. All the best.

1. Consider the signal

$$x(t) = 2[u(t) - u(t-1)] + (2-t)[u(t-1) - u(t-2)] + 3[u(t+1) - u(t)] + (t+1)[u(t+2) - u(t+1)]$$

Sketch the signals

(a) $y_1(t) = x(3 - t/2)$

(b) $y_2(t) = x(t)[\delta(t + 0.5) - \delta(t - 1.5)]$ [C01, 2 + 2 = 4 Marks]

2. Find out whether the following systems are a) linear b) time invariant

$$y_1(t) = \begin{cases} 0, & x(t) < 0; \\ x(t), & x(t) \geq 0. \end{cases} \quad \text{and} \quad y_2[n] = \begin{cases} x[n], & n \geq 1; \\ 0, & n = 0; \\ x[n], & n \leq -1. \end{cases}$$

[C01, 1.5+2 = 3.5 Marks]

3. Consider a savings account in a bank. Let $x[n]$ is the money deposited on $(n+1)$ th day and $y[n]$ is the total amount of money in the account at the end of $(n+1)$ th day. Consider that $x[n]$ and $y[n]$ are the discrete time signals and the bank account is a discrete time system. Assume that the fixed interest of 0.01% per day which gets compounded everyday. If the money is deposited as: $x[0] = ₹100$, $x[1] = -₹50$ (withdrawn), $x[2] = ₹200$, $x[10] = ₹50$, note that $x[0]$ is money deposited on day 1. Find amount of money in the account at the end of eleventh day i.e. $y[10]$. { *Tip: Read this question again, and try to relate it with concepts of systems.* } [C01, 7.5 Marks]