S/K/TY

Reg. No: 24BEE0103

Final Assessment Test – November 2025

Course: **BEEE204L** - **Signals and Systems**

Class NBR(s): **1027 / 1028 / 1030** Slot: **B1+TB1**

Time: **Three Hours** Max. Marks: **100**

- **KEEPING MOBILE PHONE/ANY ELECTRONIC GADGETS, EVEN IN 'OFF' POSITION IS TREATED AS EXAM MALPRACTICE**
- **DON'T WRITE ANYTHING ON THE QUESTION PAPER**

COs	CO Statements
CO1	Perform signal transformations on continuous and discrete - time signals and systems
CO2	Apply convolution integrals and convolution sums to obtain response of LTI systems
CO3	Apply frequency domain techniques to obtain steady state response of the continuous and discrete time LTI system.
CO4	Ability to elucidate the limitations of discrete representations of continuous time signals using sampling theorem.
CO5	Apply Laplace and Z-Transform techniques to analyze LTI systems.

BL – Blooms Taxonomy Level (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyse, 5 – Evaluate, 6 – Create)

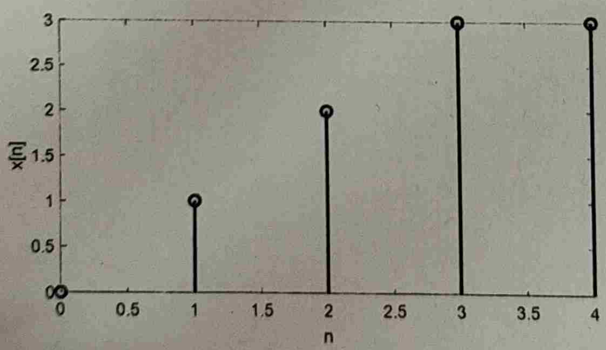
Answer ALL Questions
(10 X 10 = 100 Marks)

1. Classify the types of signals with relevant examples. **CO1 BL1**

2. i) Compute the Energy and Power of the following signal and classify the signal as an Energy or Power signal: **CO1 BL3**
$x(t) = e^{-at}\,u(t); a > 0$

   ii) Classify the system
   $y(t) = x(t-3) + x(3-t)$ as Linear, Dynamic, Causal, Stable and Time variant.

3. Perform the following operations on the signal shown below: **CO1 BL2**
i) x[n-2] ii) x[3n] iii) x[2-n]



4. Perform convolution of the signal's x[n] = {1, 2, 2, 1} and h[n] = {1, 1, 2} using tabular method. Also, show that the results obtained by linear method are same. **CO2 BL3**

5. Obtain the exponential representation Fourier series of the signal. CO2 BL4

$$x(t) = \begin{cases} A + \frac{2At}{T}, & t = -T/2 \; to \; 0 \\ A - \frac{2At}{T}, & t = 0 \; to \; T/2 \end{cases}$$

6. Find the Fourier Transform of CO3 BL4

i) $x(t) = t\, e^{-at} u(t)$

ii) $x[n] = 1, 0 \leq n \leq 4$

$\quad\quad 0$, otherwise

7.a) A causal LTI system is described by the differential equation CO3 BL4

$$\frac{d^2y(t)}{dt^2} + 6\frac{dy(t)}{dt} + 8y(t) = 2\,x(t)$$

where x(t) is the input and y(t) is the output of the system.

i) Obtain the impulse response of the system.

ii) What is the response of the system for

$$x(t) = te^{-2t}\,u(t)$$

OR

7.b) i) Obtain the inverse Fourier transform of CO3 BL4

$$X(j\Omega) = \frac{j\Omega + 3}{(j\Omega + 1)^2}$$

ii) Find x[n], if $X(e^{j\omega}) = \frac{1}{3}\frac{e^{j\omega} + 1 + e^{-j\omega}}{1 - ae^{-j\omega}}$

8. State and derive Nyquist's sampling theorem for a bandlimited signal. CO4 BL2

9. Solve the following differential equation using the Laplace transform. CO5 BL3

$\frac{d^2y(t)}{dt^2} + 6\frac{dy(t)}{dt} + 8y(t) = \frac{dx(t)}{dt} + x(t)$ with the initial conditions:

$\frac{dy(0)}{dt} = 3, y(0) = 1, x(t) = u(t)$

10.a) Find the Z transform of CO5 BL4

i) $x[n] = na^n\,u[n]$

ii) $x[n] = \left(\frac{1}{2}\right)^n u[n] + \left(\frac{1}{3}\right)^n u[n]$

OR

10.b) Find the inverse Z transform of CO5 BL4

i) $X(z) = \frac{z}{(z-3)(z+2)}$

ii) $X(z) = \frac{z(z+1)}{(z-2)(z-1)}$

⇔⇔⇔ S/K/TY ⇔⇔⇔