



**GANDHI INSTITUTE OF ENGINEERING AND TECHNOLOGY UNIVERSITY,
ODISHA, GUNUPUR
(GIET UNIVERSITY)**

B. Tech (Fourth Semester - Regular) Examinations, April - 2025

23BECPC24004– Signals and Systems

(ECE)

Time: 3 hrs

Maximum: 60 Marks

Answer ALL questions

(The figures in the right hand margin indicate marks)

PART – A

(2 x 5 = 10 Marks)

Q.1. Answer **ALL** questions

	CO #	Blooms Level
a. Find the Sampling Period and Sampling Rate of $x(t)=20\cos 100\pi t+3\sin 500t+\cos 250\pi t$?	CO1	K2
b. Define recursive system? Give an example.	CO2	K1
c. What are the properties of convolution?	CO3	K1
d. Write the time shifting property of DTFT?	CO4	K1
e. Define stability in Z- domain.	CO5	K1

PART – B

(10 x 5 = 50 Marks)

Answer **ALL** the questions

	Marks	CO #	Blooms Level
2. a. Find the even and odd components of $x(n)=\{1,-1,2,-5,4\}$	5	CO1	K1
b. Justify that unit step signal is an energy signal? (OR)	5	CO1	K1
c. Calculate the energy and power of a signal $x(n)=4 \cos \frac{n\pi}{3}$?	5	CO1	K3
d. Check whether the following signals are Periodic or Aperiodic. If Periodic, find the fundamental period. i) $x(n)=\cos(\frac{3\pi n}{5} + \frac{3\pi}{5})$ ii) $x(n)=4\sin(3\pi n+\pi)+4\cos 5\pi n$	5	CO1	K3
3.a. Draw the block diagram of $3y(n)-4x(n)-3x(n-2)+4x(n-3)-5y(n-1)-6y(n-3)=0$	5	CO2	K2
b. Check for Linearity if $y(n)=4x^2(n)$ (OR)	5	CO2	K2
c. Check for stability if $h(n)=(\frac{7}{3})^n u(-n+2)$	5	CO3	K2
d. Determine if the following systems are time-invariant and recursive? (i) $y(n)=x(n+1)$ (ii) $y(n)=n x(2n)$	5	CO2	K3
4.a. Find the linear convolution if $x(n)=\{7,-3,4,7,-5\}$ & $h(n)=\{1,-4,6,9,5,6\}$ (OR)	10	CO3	K3
b. Find the Normalized cross correlation if $x(n)=\{5,-3,4,2,6\}$ & $y(n)=\{1,-4,3,5\}$	10	CO3	K3
5.a. State and prove the convolution property of DTFT.	5	CO4	K2

- b. Find $X(e^{j\omega})$, if $x(n) = 5 \left(\left(\frac{3}{7} \right)^n + \left(\frac{1}{4} \right)^n \right) u(n)$ 5 CO4 K3
 (OR)
- c. Determine the Fourier series representation of $x(n) = \{\dots 4, -5, 3, 7, 4, -5, 3, 7, 4, -5, 3, 7, 4, -5, 3, 7, 4, -5, 3, 7, \dots\}$ 10 CO4 K3
 6.a. Prove the time shifting property of Z-transform. 6 CO5 K3
 b. Find the Z-transform of $x(n) = \cos \omega n u(n)$. 4 CO5 K3
 (OR)
- c. Find the inverse Z-transform using Long division method if $X(Z) = \frac{1}{1 - 3z^{-1} + 2z^{-2}}$ 10 CO6 K3
 i) RoC: $|Z| > 2$
 ii) RoC: $|Z| < 1$

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