Subject Code: 24EC11RC11 **R-24** **Reg No:** | | | | | | | | | | | | |

GAYATRI VIDYA PARISHAD COLLEGE OF ENGINEERING FOR WOMEN

(Autonomous)

(Affiliated to Andhra University, Visakhapatnam)

II B.Tech. - I Semester Regular Examinations, Nov – 2025

SIGNALS & SYSTEMS

(Electronics and Communication Engineering)

1. All questions carry equal marks
2. Must answer all parts of the question at one place

Time: 3Hrs. **Max Marks: 70**

UNIT-I

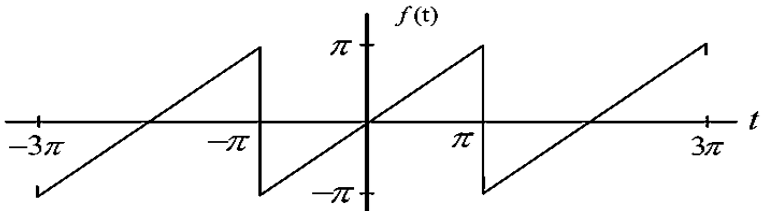
1. a. Determine the energy and power value of the following signals.
   i) $x(t) = 5\ cos\ (50t\ + 3)$, ii) $x(t) = 2e^{-|t|}$
   b. Consider x(t)=u(t+1)-u(t), plot y1(t)=x(t-4) and y2(t)=x(-t-4).

OR

2. a. Determine whether the following systems are time invariant or not.
   i) $y(t) = t^2\ x(t-1)$ ii) $y\ (n) = x(2n\text{-}2)$
   b. Explain the difference between the following systems with examples. a) Linear and Non-linear systems. b) Causal and Non-Causal systems.

UNIT-II

3. a. Determine the Exponential Fourier series representation of the signal shown below and explain about complex spectrum.



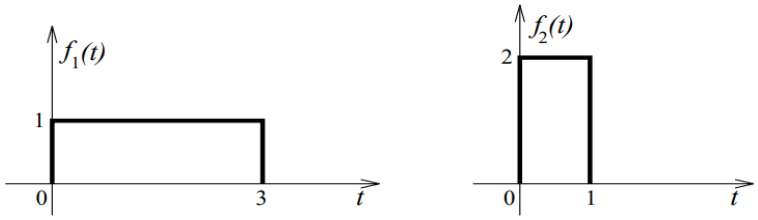
   b. Derive the relationship between trigonometric and exponential Fourier Series coefficients.

OR

4. a. Obtain Fourier Transform of $e^{-at}u(t)$ and hence determine Fourier Transform of $te^{-at}u(t)$ and $e^{at}u(-t)$ by applying its properties.
   b. Discuss the convergence of DTFT and State and prove any four properties of it.

UNIT-III

5. a. Perform graphical convolution between the signals



   b. List the properties of convolution and prove any two of them.

OR

6. a. Given two signals x[n]={1,2,3} and y[n]={3,2,1}compute their cross-correlation.
   b. Show that cross-correlation can be expressed as convolution of one signal with a time-reversed version of the other.

UNIT-IV

7. a. Determine the Laplace transform for $x(t) = e^{-at}\left[Acosbt + \frac{B-Aa}{b} sinbt\right] u(t)$.
   b. Find the impulse response of a continuous time LTI system with H(s) = (S-1)/((S+1)(S+2)) such that i) Re[S] >2 ii) -1 < Re[S] < 2

OR

8. a. A signal has Laplace transform $X(s) = \frac{s+1}{s^2+3s+4}$. Determine the Laplace transform for the signals:
   i) x(2t), ii) e^{-2t} x(t) , iii) x(t-2).

   b. Prove that the signals $x_1(t) = e^{-at}u(t)\ and\ x_2(t) = -e^{-at}u(-t)$ have the same X(s) and differ only in ROC

UNIT-V

9. a. Explain in short about sampling, under sampling and anti-aliasing filter.
   b. A signal x(t)=sin(150πt) is sampled at a rate of (i) 100Hz (ii) 200 Hz (iii) 300Hz. For each of these cases with neat sketch of spectrum, explain if you can recover the signal x(t) from the sampled signal.

OR

10. a. A causal LTI system is described by the following difference equation
    $y(n) - y(n-1) - y(n-2) = x(n-1)$. Verify whether the system is stable or not.
    b. Evaluate inverse Z-Transform of $X(z) = \frac{z^2+2z+3}{(z-1)(z-3)(z-4)}$, $for\ |z| > 4\ and\ |z| < 1$