JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST-1 EXAMINATION-AUGUST-2025

B.Tech- V^{th} Semester (ECE)

COURSE CODE (CREDITS): 18B11EC511 (4)   MAX. MARKS: 15

COURSE NAME: Principles of Digital Signal Processing

COURSE INSTRUCTOR: Dr. Pardeep Garg   MAX. TIME: 1 Hour

Note: (a) All questions are compulsory. (b) The candidate is allowed to make suitable numeric assumptions wherever required for solving problems.

Q. No	Question	CO	Marks
Q1	Determine whether the following signal is a energy, power signal or neither energy nor power signal: $$x(n) = \left(\frac{1}{3}\right)^n . u(n)$$	CO-1	1.5
Q2	Check whether the following systems are causal or non causal. Justify your answer with technical details at each step: i) $y(n) = 0.5y(n-2) + 0.7y(n-1) + x(n) + 6x(n-4)$ ii) $y(t) = x(t^2)+9x(t-5)$	CO-1	1.5+1.5=3
Q3	Check whether the following system is linear or non linear. Justify your answer with technical details at each step: $$y(n) = x^2(n) + 5x(n-2)$$	CO-1	1.5
Q4	A continuous-time signal has to be sampled to obtain the discrete-time signal. a) Define the sampling theorem in this context. b) What is Nyquist rate? c) Discuss aliasing and the way to overcome it.	CO-1	3
Q5	Determine whether the signal $x(t) = \cos(5t) + \sin(3t)$ is periodic or aperiodic. If periodic, compute its fundamental period also.	CO-1	2
Q6	Explain how the s-domain is mapped into the z-domain using the relation $z = e^{st}$. Also, show how the stability region in the s-plane maps into the z-plane.	CO-2	2
Q7	Compute the z-transform of the sequence given by: $$\begin{cases} 2^n, & n < 0 \\ \left(\frac{1}{2}\right)^n, & n = 0,2,4 \\ \left(\frac{1}{3}\right)^n, & n = 1,3,5 \end{cases}$$	CO-2	2