JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST–1 EXAMINATION – 2026

B.Tech–IV Semester (ECE)

COURSE CODE (CREDITS): 25B11EC413 (4) **MAX. MARKS:** 15

COURSENAME: DIGITAL SIGNAL PROCESSING

COURSE INSTRUCTORS: Dr. Vikas Baghel **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.

(c) Use of calculators is allowed.

Q.No	Question	CO	Marks
Q1	a. Perform the circular convolution of the following two sequences: $$x_1(n) = \{\underset{\uparrow}{2}, 1, 2, 1\}, \qquad x_2(n) = \{\underset{\uparrow}{1}, 2, 3, 4\}.$$	CO1	[1]
	b. Compute the four-point DFT of the sequence $$x(n) = \begin{cases} 1, & 0 \le n \le 3, \\ 0, & \text{otherwise}, \end{cases}$$ using the decimation-in-time FFT algorithm.		[2]
	c. Find the linear convolution $y[n] = x[n] * h[n]$ using overlap-add (OLA) method where $$x[n] = \{1, 2, 3, 4, 5, 6, 7, 8\}, \qquad h[n] = \{1, 1, 1\}.$$ Using an FFT length of $N = 4$:		[3]

54

Q.No	Question	CO	Marks
Q2	a. Determine the power and energy of the unit step sequence. b. The impulse response $h[n]$ of an LTI system is given by $h[n] = u[n+3] + u[n-2] - 2u[n-7]$. Determine whether the system is stable or unstable, and whether it is causal or noncausal. Show your reasoning. c. The impulse response of a linear time-invariant system is $h(n) = \{1, \underset{\uparrow}{2}, 1, -1\}$. Determine the response of the system to the input signal $x(n) = \{\underset{\uparrow}{1}, 2, 3, 1\}$.	CO1	[1] [2] [1]
Q3	a. Determine the z-transform and the ROC of the signal $$x(n) = [3\,(2^n) - 4\,(3^n)]\,u(n).$$ b. Determine the signal $x(n)$ whose z-transform is given by $$X(z) = \log\left(1 + az^{-1}\right), \qquad \lvert z\rvert > \lvert a\rvert.$$	CO1	[2.5] [2.5]