JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST–3 EXAMINATION – 2026

B.Tech–VII Semester (CSE)

COURSE CODE (CREDITS): 18B1WEC636 (2) **MAX. MARKS:** 35

COURSENAME: Fundamentals of Digital Signal Processing & Applications

COURSE INSTRUCTORS: Dr. Vikas Baghel **MAX. TIME:** 2 Hours

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)** Differentiate between a discrete-time signal and a digital signal. Give one example of each.	CO1	[2]
	(b) State the discrete-time convolution sum and compute $y[n] = x[n] * h[n]$ for $x[n] = \{1, 1\}$ and $h[n] = \{1, -1, 2\}$.		[3]
Q2	**(a)** A causal LTI system is governed by $$y[n] - 0.6y[n-1] = x[n] + x[n-1].$$ Obtain the system function $H(z)$ and indicate its pole and zero.	CO2	[3]
	(b) For the above system, state the ROC, comment on BIBO stability, and write the first three samples of the impulse response $h[n]$.		[4]
Q3	**(a)** Compute the 4-point DFT of $$x[n] = \{1, 2, 1, 0\}, \qquad 0 \leq n \leq 3$$ using the radix-2 DIT-FFT algorithm.	CO2	[4]
	(b) Differentiate DIT-FFT and DIF-FFT. Why is FFT preferred over direct DFT computation?		[3]
Q4	**(a)** What is linear phase in an FIR filter? Show whether $h[n] = \{1, 2, 3, 2, 1\}$ is a linear-phase FIR sequence.	CO3	[3]

Q.No	Question	CO	Marks
	(b) Using bilinear transformation with sampling period $T = 1\,\text{s}$, obtain the digital filter corresponding to the analog low-pass prototype $$H_a(s) = \frac{1}{s+1}.$$ Write $H(z)$ and the corresponding difference equation.		[5]
Q5	**(a)** Mention any three DSP application areas from the syllabus and one representative task in each area.	CO4	[3]
	(b) A noisy speech signal is to be enhanced digitally. Propose a DSP processing chain using transform-domain analysis, filtering, and output reconstruction. Also state one measure used to assess improvement.		[5]