JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST-3 EXAMINATION-DECEMBER-2025

B.Tech-Vth Semester (ECE)

COURSE CODE (CREDITS): 18B11EC511 (4) MAX. MARKS: 35

COURSE NAME: Principles of Digital Signal Processing

COURSE INSTRUCTOR: Dr. Pardeep Garg 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) A Scientific Calculator (non-programmable) is allowed.

Q. No	Question	CO	Marks
Q1	Given $x(n) = \{1, 2\}$ *and* $h(n) = \{1, 2, 4\}$ Compute the response of an FIR filter by finding out the following: i) linear convolution of x(n) and h(n) ii) linear convolution through circular convolution with padding of zeros.	CO-3	2.5+2.5=5
Q2	*Given* $x(n) = 2^n$, and N=8; compute X(k) using Radix-2 DIT FFT algorithm. Show the output at each stage.	CO-5	8
Q3	Discuss the advantages of FIR filters over IIR filters; also if IIR filters have some merits over IIR filters, discuss in detail.	CO-3	2.5+1.5=4
Q4	a) Discuss the problems involved in the designing of FIR filters using Fourier Series Method. b) One of the possible solutions of the problem (part a) is through Windowing. Discussing the windowing technique, discuss the functioning of any four Window functions.	CO-3	3+4=7
Q5	For the analog transfer function $$H(s) = \frac{1}{(s+1)(s+2)}$$ Determine H(z) using impulse invariant technique. Assume T=1s	CO-3	4
Q6	a) Convert the analog filter with system function $$H(s) = \frac{s+0.1}{(s+0.1)^2 + 9}$$ into a digital IIR filter using bilinear transformation. The digital filter should have a resonant frequency of $w_r = \frac{\pi}{4}$. b) Discuss Frequency Warping effect.	CO-3 CO-3	2.5 1.5
Q7	Draw the *direct forms I and II realizations* for a third-order IIR transfer function: $$H(z) = \frac{0.28z^2 + 0.319z + 0.04}{0.5z^3 - 0.3z^2 - 0.17z + 0.2}$$	CO-4	1.5+1.5=3