JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -1 EXAMINATION- 2025

B.Tech-VII Semester (Open Elective)

COURSE CODE (CREDITS): 18B1WEC636 (2) MAX. MARKS: 15

COURSE NAME: Fundamentals of Digital Signal Processing & Applications

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

Q.No	Question	CO	Marks
Q1	Determine whether or not each of the following signals is periodic. If a signal is periodic, specify its fundamental period. i. $x[n] = u[n] + u[-n]$ ii. $x[n] = e^{\frac{\pi}{4}} e^{jn}$	CO1	[3]
Q2	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.	CO1	[3]
Q3	Given the finite length input $x[n]$ and the corresponding finite length output $y[n]$ of an LTI system as shown below, the impulse response $h[n]$ of the system is $x[n]=\{1, -1\} \longrightarrow \boxed{h[n]} \longrightarrow y[n] = \{1, 0, 0, 0, -1\}$	CO1	[3]
Q4	Show that the system described by equation $y[n] = 3n^2 x(n)$ is linear and time-varying system.	CO1	[3]
Q5	A continuous-time signal $x(t) = \cos(200\pi t)$ is to be sampled and reconstructed. a. Determine the minimum sampling frequency required to avoid aliasing as per the Sampling Theorem. b. Suppose the signal is instead sampled at $f_s = 150\ Hz$. Explain and sketch the spectrum of the sampled signal and discuss whether aliasing occurs.	CO4	[3]