(203)

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATIONS- 2026

B.Tech-II Semester (ECS/ECE)

COURSE CODE (CREDITS): 25B11EC414/25B11EC311 MAX MARKS: 25

COURSE NAME: SIGNALS AND SYSTEMS

COURSE INSTRUCTOR: Dr Rajiv Kumar MAX. TIME: 1 Hour 30 Min

Note: (a) All questions are compulsory.

(b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

(c) Use of non-programmable calculator is allowed

Q.No	Question	CO	Marks
Q1	A) You are given following signal $x(t)$: $$x(t) = t[u(t) - u(t-3)]$$ Evaluate its first differentiation $\frac{dx(t)}{dt}$ and plot it with respect to time. B) What is the most significant advantage of representing a signal x(t) using a Fourier Series expansion?	CO-1	5
Q2	A continuous-time signal is defined as $$x(t) = 2+\cos(2\pi t)+A\sin(\pi t)$$ 1. Determine the fundamental angular frequency ω_0 of the signal. 2. Compute the exponential Fourier series coefficients a_k. 3. Express the signal in exponential Fourier series form. 4. Sketch the magnitude spectrum and phase spectrum corresponding to the Fourier series representation.	CO-3	5
Q3	For each of the following two different continuous-time signals: $$x(t) = e^{-a\|t\|}, \quad a > 0$$ and, $$x(t) = \delta(t - t_0)$$ Perform the following tasks: 1. Determine the Fourier Transform X(ω). 2. Sketch the magnitude spectrum |X(ω)|. 3. Sketch the phase spectrum ∠X(ω). Present all results clearly as functions of angular frequency 'ω' .	CO-3	5

Q4	A) Explain Gibbs' phenomenon associated with Fourier Series. Why does it occur, and what does it indicate about the convergence of the series near discontinuities? B) Explain the time reversal property and its effect on Fourier coefficients both discrete and continuous time.	CO-3	2.5+2.5 = 5
Q5	A) A discrete-time LTI system has the impulse response $$h[n] = \frac{1}{N}.(u[n] - u[n-N])$$ and is excited by the input signal x[n] = u[n]. Using the convolution property of the Discrete Time Fourier Transform, obtain the expression for the output spectrum $Y(e^{j\omega})$. B) State and prove the Parseval's theorem for Discrete Time Fourier Transform (DTFS).	CO-3	3+2 =5