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JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATIONS- 2026

B.Tech-IV Semester (ECS)

COURSE CODE (CREDITS): 25B11EC311 (04)

MAX MARKS: 35

COURSE NAME: SIGNALS AND SYSTEMS

COURSE INSTRUCTOR: Dr Rajiv Kumar

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 scientific calculator is allowed

Q.No	Question	CO	Marks
Q1	(A) Express the signal $x(t) = 3e^{-t}u(t) + 2e^t u(-t)$ as a sum of even and odd components: (B) Determine whether the signal $x(t) = \sin(4t) + \cos(6t)$ is periodic or non-periodic. If periodic, find its fundamental period.	CO-1	2+2=04
Q2	(A) Determine whether the system is linear, time-invariant, and stable: $y(t) = t x(t) + 5$ (B) Check whether the system $y(t) = x^2(t)$ is invertible.	CO-1	2+2=04
Q3	(A) Find the convolution of the following signals: $x(t) = u(t) - u(t - 2)$ and $h(t) = e^{-t} u(t)$ (B) Define impulse response and explain its significance in system analysis.	CO-2	2+2=04
Q4	(A) Determine the exponential Fourier series coefficients of the periodic signal: $x(t) = 2 \cos(2t) + 3 \sin(4t)$ (B) State the Dirichlet conditions for Fourier series representation.	CO-3	2.5+2.5=05
Q5	(A) Find the Fourier Transform of: $x(t) = e^{-2t} u(t)$ (B) State and explain the time-shifting property of Fourier Transform.	CO-3	2.5+2.5=05
Q6	(A) Find the Laplace Transform and ROC of: $x(t) = e^{-3t} u(t)$ (B) What is the significance of ROC in system analysis? (C) Using Laplace Transform, solve the differential equation:	CO-4	2+2+2=06

	$\frac{d^2 y(t)}{dt^2} + 3 \frac{dy(t)}{dt} + 2y(t) = u(t)$ with initial conditions $y(t) = 0, y'(0) = 1$		
Q7	(A) A system has transfer function: $H(z) = \frac{1 - 0.5z^{-1}}{1 - 1.5z^{-1} + 0.5z^{-2}}$ Find: (i) poles and zeros (ii) ROC (B) Find the inverse Z-transform of $X(z) = \frac{z}{(z-1)(z-2)}$ for the following (i) $z > 2$ ROCs: (ii) $1 < z < 2$ (C) Using the properties of Z-transform, determine the Z-transform of $x[n] = n a^n u[n]$ and specify the ROC.	CO-5	2+2.5+ 2.5=07