JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

Supplementary Examination- 2026

B.Tech-III Semester (ECE)

COURSE CODE(CREDITS): 25B11EC311 (4) MAX. MARKS: 75

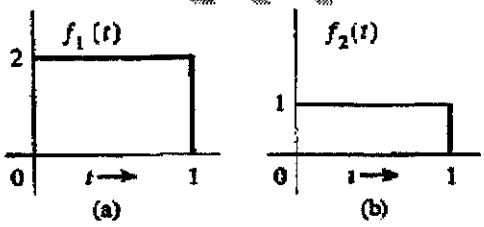
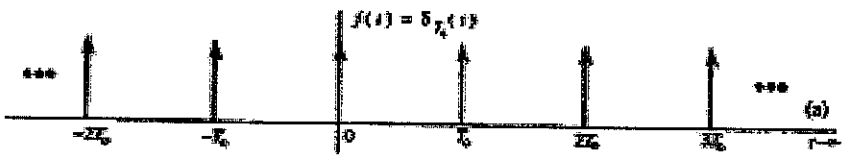
COURSE NAME: Signals and Systems

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 a standard scientific calculator is allowed.

Q.No	Question	CO	Marks
Q1	a) Determine whether or not each of the following signals is periodic. If signal is periodic, specify its fundamental period. a. $x(t) = e^{(-1+j)t}$ b. $x[n] = e^{j7\pi n}$ b) Show that the energies of the given signals are 4 and 1, respectively. 	CO1	[6] [6]
Q2	a) Show that the system described by a equation $$\frac{dy}{dt} + 3y(t) = x(t)$$ is LTI (linear and time-invariant) system. b) Compute the convolution $y[n] = x[n] * h[n]$, where $x[n] = \left(\frac{1}{3}\right)^{-n} u[-n-1]$ and $h[n] = u[n-1]$	CO2	[6] [6]
Q3	a) Find the exponential Fourier series and sketch the corresponding spectra for the impulse train $\delta_{T_0}(t)$ depicted in figure. 	CO3	[7]

	b) Given that $X(w)$ id the CTFT of signal $x(t)$. Express the CTFT of $\frac{d^2}{dt^2}x(1-t)$ in terms of $X(w)$.		[6]
Q4	a) Determine the inverse Laplace transform of the $X(s) = \frac{s+2}{s^2+7s+12}$, $-4 < Re\{s\} < -3$. b) An LTI system has following transfer function $H(s) = \frac{3-s}{(s+3)(s^2-4)}$. Determine the following (i) Draw poles and zeros of the systems (ii) Stability of the system (iii) Causality of the system.	CO4	[6] [7]
Q5	a) Using long division method, determine four terms of inverse z-transform of $$H(z) = \frac{1-\frac{1}{2}z^{-1}}{1+\frac{1}{2}z^{-1}}$$ b) A causal LTI system is defined by the following difference equation $$y[n] + \frac{1}{4}y[n-1] - \frac{1}{8}y[n-2] = x[n]$$ Determine the system function and the impulse response of the system.	CO4	[6] [7]
Q6	a) Define the four basic digital filtering functions and sketch their ideal frequency responses. b) Given the transfer function $H(z) = \frac{(1+2z^{-1})}{(1-0.5z^{-1})}$ i. Identify if it is FIR or IIR. ii. Draw the Direct Form I realization.	CO1	[6] [6]