

K. J. Somaiya Institute of Technology, Sion, Mumbai-22
(Autonomous College Affiliated to University of Mumbai)

Subject Code: EXC 405

Subject Name: Signals and Systems

Date: 23/05/2023

May -June 2023 Program: B.Tech .(Electronics and Telecommunication) Examination: SY Semester: IV Course Code: EXC405 and Course Name: Signals and Systems Duration: 2.5 Hours Max. Marks: 60				
Instructions: 1. All questions are compulsory. 2. Draw neat diagrams wherever applicable. 3. Assume suitable data, if necessary.				
		Max. Marks	CO	BT level
Q 1	Solve any six questions out of eight:	12		
i)	A discrete time signal is given by $x(n)=\{1,0,1,0,1,1,1\}$ Sketch signal $x(n)$	02	CO1	U
ii)	Write any two types of elementary signals with mathematical equation and sketch its graphical plot.	02	CO1	R
iii)	State any two properties of Autocorrelation function of DT energy signal.	02	CO2	R
iv)	State analogy between correlation and convolution.	02	CO2	R
v)	state relation between Fourier coefficient of trigonometric form and exponential form.	02	CO3	U
vi)	Define Fourier transform and Inverse Fourier transform with its mathematical expression.	02	CO4	R
vii)	Find final value $x(\infty)$ for following signal using final value theorem of Laplace transform: $X(s)=1/[s(s-1)]$.	02	CO5	U
viii)	State any two properties of Z transform.	02	CO6	R
Q.2	Solve any four questions out of six.	16		
i)	Determine following signals are periodic or not? if periodic, find fundamental period of following signals: a) $x(t)= 2 \cos (\pi t/3) +3 \cos (\pi t/4)$. b) $x(t)=14 + 40 \cos (60 \pi t)$	04	CO1	Ap
ii)	Determine cross correlation between two sequences: $x_1(n)=\{1,1,2,2\}$ and $x_2(n)=\{1,3,1\}$ using Tabular Method.	04	CO2	Ap

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iii)	Explain Gibbs phenomenon.	04	CO3	U _i
iv)	Obtain the Fourier transform of $A \cos \omega_0 t$.	04	CO4	Ap
v)	Determine the Laplace Transform of continuous time signals and sketch its ROC in s plane. $x(t) = e^{-at}u(t)$ where $a > 0$	04	CO5	Ap
vi)	Determine z Transform of following sequences: $x(n) = n^2 u(n)$	04	CO6	Ap
Q.3	Solve any two questions out of three.	16		
i)	Determine whether given system is i) memoryless ii) causal iii) time invariant iv) linear a) $y[n] = n x[n]$ b) $y[n] = x[-n]$	08	CO1	Ap
ii)	a) Find Fourier transform of following time functions $x(t) = e^{-at} u(t)$; $a > 0$, sketch its amplitude and phase spectra b) Find Fourier transform of following time functions $x(t) = 1$ for all t , sketch its amplitude and phase spectra.	08	CO4	Ap
iii)	The differential equation of the system is $d^2y(t)/dt^2 + 5 dy(t)/dt + 4 y(t) = dx(t)/dt$ with $y(0^-) = 0$ and $dy(0^-)/dt = 1$ for input $x(t) = e^{-2t} u(t)$. Using Laplace Transform determine complete response of the system.	08	CO5	Ap
Q.4	Solve any two questions out of three.	16		
i)	Compute linear convolution (convolution sum) of following sequences: $x(n) = \{1, 2, 3, 1\}$ and $h(n) = \{1, 2, 2, -1\}$ Using direct computation and tabular method.	08	CO2	Ap
ii)	Obtain Convolution of given signals using Convolution Integral $x(t) = 1$ for $-1 \leq t \leq 1$ $h(t) = 1$ for $0 \leq t \leq 2$	08	CO2	Ap
iii)	Determine Inverse z Transform of $X(z) = (1 - 2z^{-1}) / (1 - 7/12 z^{-1} + 1/12 z^{-2})$ if ROC : $ z > 1/3$ ii) ROC : $ z < 1/4$ iii) ROC : $1/4 < z < 1/3$.	08	CO6	Ap
