

Date: 21/12/22

K. J. Somaiya Institute of Engineering and Information Technology, Sion, Mumbai-22

(Autonomous College Affiliated to University of Mumbai)

End Semester Exam

November - December 2022

(B.Tech/M.Tech.) Program: Electronics and Telecommunication

Examination: SY Semester: IV

Course Code: 1UEXC405

and

Course Name: Signals and Systems

Duration: 03 Hours

Max. Marks: 60

Instructions:

(1) All questions are compulsory.

(2) Draw neat diagrams wherever applicable.

(3) Assume suitable data, if necessary.

Q No.	Questions	Max. Marks	CO	BT level
Q 1	Solve any six questions out of eight.	12	-	-
i)	A discrete time signal given by $x[n] = \{1,1,1,1,2\}$. $x[n] = \{1,1,3,4,2\}$. ↑ Sketch the following signals: $x[n]$, $x[n-2]$, $x[n] u[n-1]$, $x[3-n]$	2	CO 1	U
ii)	State whether the following signal is periodic or not, giving reasons. If it is periodic, find the corresponding period: $x(t) = 2 \cos 100 \pi t + 5 \sin 50 t$.	2	CO 1	U
iii)	Define Auto correlation and Cross correlation	2	CO 2	U
iv)	Explain types of Fourier series.	2	CO 3	U
v)	Write short note on time domain and frequency domain (spectrum) representation with suitable example	2	CO 3	U
vi)	State Merits of Fourier transform	2	CO 4	U
vii)	List out applications of Laplace Transform.	2	CO 5	U

viii)	Find initial value $x(0)$ and final value $x(\infty)$ of the given z-transform $X(z) = 2z^2 / (1 - 1.8z^{-1} + 0.8z^{-2})$	2	CO6	U
Q.2	Solve any four questions out of six.	16		
i)	Find and Sketch Even and Odd parts of $x[n] = u[n] - u[n-5]$	4	CO 1	AP
ii)	Compute Linear convolution using tabular method of the following sequence: $x[n] = \{1, 2, 3, 1\}$, $h[n] = \{1, 2, 2, -1\}$	4	CO 2	AP
iii)	Obtain fourier series for given signal $f(t) = V/2 t$, $0 < t < 2$ $T = 2 \text{ sec}$, $w_0 = 2\pi/T = \pi$ rad/sec	4	CO3	AP
iv)	Obtain Fourier transform of delta function	4	CO4	AP
V)	Obtain Laplace Transform of $B \sin wt u(t)$.	4	CO5	AP
Vi)	Perform convolution of $x_1(n)$ and $x_2(n)$ using the property of z-transform. $x_1(n) = \{1, -2, 1\}$ $x_2(n) = \{1, 1, 1, 1, 1\}$	4	CO6	AP
Q.3	Solve any two questions out of three.	16		
i)	Explain any five elementary signals with mathematical equation and graphical plot	8	CO 1	AP
ii)	Compute Linear convolution using direct computation method and tabular method of the following sequence: $x[n] = \{1, 2, 4\}$, $h[n] = \{1, 1, 1\}$	8	CO 2	AP
iii)	Find Fourier transform of $x(t)$ is given by $x(t) = u(t)$ and using properties of Fourier transform find Fourier transform of $y(t) = u(2t) + u(t-1)$	8	CO4	AP
Q.4	Solve any two questions out of three.	16		
i)	Find the auto-correlation of the signal $X(t) = (\cos \pi t)[u(t+2) - u(t-2)]$ and sketch the autocorrelation.	8	CO 2	AP
ii)	Find transfer function, impulse response of a continuous time LTI system, also sketch impulse and step response $dy(t)/dt = 2y(t) = 3x(t)$.	8	CO5	AP
iii)	Compute the inverse z-transform using partial fraction method: $X(z) = 1/(1 - 1.5z^{-1} + 0.5z^{-2})$ if 1. ROC $ Z > 1$ 2. ROC $ Z < 0.5$ 3. ROC $0.5 < Z < 1$	8	CO6	AP