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

(Autonomous College Affiliated to University of Mumbai)

End Semester Exam

May – June 2022

(B.Tech/M.Tech.) Program: Electronics and Telecommunication
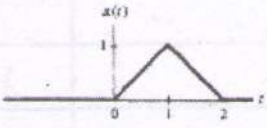
Examination: SY Semester: IV

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)	Explain any two elementary signals with mathematical equation and graphical plot.	2	CO 1	U
ii)	Sketch the signal x(t+6) and x(3t)	2	CO 1	U
iii)	State relation of ESD and PSD with Cross-correlation	2	CO 2	U
iv)	Explain relation between Z transform and DTFT	2	CO3	U
v)	Explain CTFS and DTFS.	2	CO3	U
vi)	Define Fourier transform and Inverse Fourier transform.	2	CO4	U
vii)	Find initial value and final value of 1/s+2	2	CO5	U
viii)	What is the need of the Z- transform and advantages of the z-transform.	2	CO6	U

Q.2	Solve any four questions out of six.	16		
i)	Find Energy and Power of Signal: (i) $x[n] = \cos(\pi n)$ $-4 \le n \le 4$ otherwise $x[n] = 0$ (ii) $x(t) = \cos wt$	4	CO 1	AP
ii)	Compute Linear convolution of the following sequence: $x[n]$ = {1,2,3,1}, $h[n]$ = {1,2,2,-1}	4	CO 2	AP
iii)	Find the fourier series of a periodic signal $f(t) = V$, $0 < t < T/2$ $= 0$, $T/2 < t < T$	4	CO3	AP
iv)	Obtain Fourier transform of a dc signal	4	CO4	AP
V)	Find Laplace transform of d/dt sin t u(t).	4	CO5	AP
Vi)	The impulse response of DT system is given by $h(n)$ = {1,2,3} and output response is given by $y(n)$ = {1,1,2,-1,3}. Using z-transform determine $x(n)$ by long division method.	4	CO6	AP
Q.3	Solve any two questions out of three.	16		
i)	For the given system $y[n] = nx[n]$, determine whether it is : 1. Memoryless 2.Causal 3. Linear 4.Time-invariant	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)	State any eight properties of Fourier transform. Give proof of Frequency Shifting property	8	CO4	AP
Q.4	Solve any two questions out of three.	16		
i)	Find auto-correlation, power spectral density and power of the following signal: $x(t) = 3 + 4 \sin(10\pi t + 30°)$	8	CO 2	AP
ii)	Using Laplace transform determines the complete response of the system. The differential equation of the system is given by $d^2y(t)/dt^2 + 6dy(t)/dt + 8y(t) = dx(t)/dt + x(t)$ with $y(0) = 1$. $dy(0)/dt = 3$ for input $x(t) = u(t)$.	8	CO5	AP
iii)	Find the response of the time invariant system with impulse response $h[n]$ = {1,2,1,-1} to an input signal $x[n]$ = {1,2,3,1} using convolution as well as using z-transform. Verify your answers.	8	CO6	AP