


 B.Tech - Odd Sem : End Semester Exam
Academic Year:2020-2021

19EC2104 - Communication Signals & System Design

Set No: 4

Time:		Max.Marks: 100			
S.NO	Answer All Questions	Choice	Options	Marks	CO
1.	Design a signal $x(t)=t$ for $0 \leq t \leq 1$; $x(t)=2-t$ for $1 \leq t \leq 2$. Then obtain its even and odd components.	choice Q-2		10Marks	CO1
2.	Consider a discrete time signal $x(n)=\{1,1,1,1,2\}$ and design (i). $x(n-1)\delta(n-1)$, (ii). $x(3-n)$. Hint: The second sample is at origin.			10Marks	CO1
3.	Answer 3.A and 3.B	choice Q-4		15Marks	CO1
3.A.	Design a communication signal represented by $r(0.25t + 1)$.			7.5Marks	CO1
3.B.	Sketch the signal $x(n) = u(n+4) - u(n-2)$.			7.5Marks	CO1
4.	Answer 4.A and 4.B			15Marks	CO1
4.A.	Design a signal described an expression $r(-2)u(t+2)$.			7.5Marks	CO1
4.B.	A typical communication signal is defined as $x(t)=1$ for $-1 \leq t \leq 1$; $x(t)=0$ otherwise. Then design $x(-2+t)$ and $x(t+1)u(t)$.			7.5Marks	CO1
5.	Using Fourier transform, evaluate the convolution of the signals $x_1(t)=e^{-2t} u(t)$ and $x_2(t)=e^{-3t} u(t)$. $x_1(t)=e^{-2t} u(t), x_2(t)=e^{-3t} u(t)$	choice Q-6		10Marks	CO2
6.	Determine the inverse Fourier transformation of $X(\omega) = 1 / (a+j\omega)(a-j\omega)$ using a suitable property only.			10Marks	CO2
7.	Answer 7.A and 7.B	choice Q-8		15Marks	CO2
7.A.	Elaborate the time shifting and time scaling property of FT with necessary derivation.			7.5Marks	CO2
7.B.	Give the significance of a signum function in communication systems and determine its Fourier transformation.			7.5Marks	CO2
8.	Answer 8.A and 8.B			15Marks	CO2
8.A.	Design a FT pair with a first order fundamental frequency shifts in positive direction.			7.5Marks	CO2
8.B.	Design a triangular pulse with amplitude A, time period between $-T/2$ and $T/2$ and determine its FT.			7.5Marks	CO2
9.	Design a system given by $y(n) - (5/6)y(n-1) + (1/6)y(n-2) = x(n) + 2x(n-1)$.	choice Q-10		10Marks	CO3
10.	Find the difference equation satisfying the input and output of an LTI system with transfer function. $H(z) = \frac{(1 + z^{-1})^2}{(1 - \frac{1}{2}z^{-1})(1 + \frac{3}{4}z^{-1})}$			10Marks	CO3
11.	Answer 11.A and 11.B	choice Q-12		15Marks	CO3
11.A.	Determine the Nyquist rate and Nyquist interval for the signal: $x(t)= (1/2\pi). \cos(4000\pi t). \cos(1000\pi t)$ $x(t)= (1/2\pi). \cos(4000\pi t). \cos(1000\pi t)$			7.5Marks	CO3
11.B.	Find the impulse response and step response for the following system: $y(n)=x(n)+2x(n-1)-4x(n-2) + x(n-3)$. $y(n)=x(n)+2x(n-1)-4x(n-2) + x(n-3)$			7.5Marks	CO3
12.	Answer 12.A and 12.B			15Marks	CO3
12.A.	Derive convolution property of Z transformation.			7.5Marks	CO3
12.B.	Determine the response of the following system: $x(n+2) - 3x(n+1) + 2x(n)=\delta(n)$. Assume that all the initial conditions are zero.			7.5Marks	CO3
13.	Determine the DTFT of the sum of two sequences as follows, Sketch their spectra. Comment on which property of the DTFT explains the similarity between the spectra.	choice Q-14		10Marks	CO4

	$\mathbf{x}_1[n] = \left(0.5, \underset{\uparrow}{0}, -0.5 \right), \mathbf{x}_2[n] = \left(\underset{\uparrow}{0}, 0, 0, 0.5, 0, -0.5 \right)$			
14.	Determine the frequency response and impulse response of a DTLTI system described as $y(n) = B \cdot y(n-1) + x(n)$, where $ B < 1$.			10Marks CO4
15.	Answer 15.A and 15.B	choice Q-16		15Marks CO4
15.A.	Find the discrete-time Fourier transform of unit step sequence $x(n) = u(n)$.			7.5Marks CO4
15.B.	Consider a discrete-time periodic signal as $x(n) = \cos \omega_0 n$, with $\omega_0 = 2\pi/5$. Then evaluate its discrete-time Fourier transform. $\mathbf{x(n)} = \mathbf{COS \omega_0 n}, \quad \omega_0 = \frac{2\pi}{5}$			7.5Marks CO4
16.	Answer 16.A and 16.B			15Marks CO4
16.A.	Derive modulation property of DTFT pair.			7.5Marks CO4
16.B.	Find the output $y(n)$ of a causal discrete-time LTI system which is characterized by the difference equation as follows. $\mathbf{y(n)} - \frac{3}{4}\mathbf{y(n-1)} + \frac{1}{8}\mathbf{y(n-2)} = 2\mathbf{x(n)}, \mathbf{x(n)} = \left(\frac{1}{4}\right)^n \mathbf{u(n)}$			7.5Marks CO4

[object HTMLDivElement]