University of Mumbai
Examination June 2021
Examinations Commencing from 1st June 2021

Program: Electronics Engineering
Curriculum Scheme: Rev2016
Examination: TE Semester VI
Course Code: ELX604 and Course Name: Signal and Systems

Time: 2 hour Max. Marks: 80

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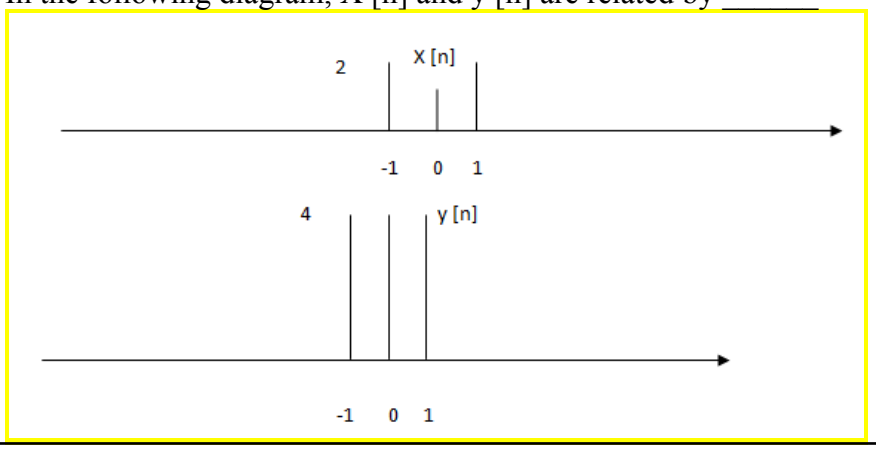
Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	What is the area of a Unit Impulse function?
Option A:	Zero
Option B:	Half of Unity
Option C:	Depends on the function
Option D:	Unity
2.	Y (t) = x (2t) is _____
Option A:	Compresses signal
Option B:	Expanded signal
Option C:	Shifted signal
Option D:	Amplitude scaled signal by a factor of 2
3.	In the following diagram, X [n] and y [n] are related by _____ 
Option A:	Y [n] = 2*x [n]
Option B:	Y [n] = -2*x [n]
Option C:	Y [n] = x [2n]
Option D:	Y [n] = x [-2n]
4.	In the equation x (t) = be^{at} if a < 0, then it is called _____
Option A:	Growing exponential
Option B:	Decaying exponential
Option C:	Complex exponential
Option D:	Both growing and Decaying exponential

5.	X [n] = 2 cos (2n) is periodic or not?
Option A:	Periodic with period 2n
Option B:	Periodic with period 2π
Option C:	Periodic with period 2
Option D:	Non periodic
6.	The step function u (t) is integral of _____ with respect to time t.
Option A:	Ramp function
Option B:	Impulse function
Option C:	Sinusoidal function
Option D:	Exponential function
7.	An example of a discrete set of information/system is
Option A:	the trajectory of the Sun
Option B:	Data on CD
Option C:	universe time scale
Option D:	movement of water through a pipe
8.	A system is said to be defined as non causal, when
Option A:	the output at the present depends on the input at an earlier time
Option B:	the output at the present does not depend on the factor of time at all
Option C:	the output at the present depends on the input at the current time
Option D:	the output at the present depends on the input at a time instant in future
9.	Zero-input response is also known as
Option A:	zero-state response
Option B:	Natural response
Option C:	state-input response
Option D:	Forced response
10.	Which of the following systems is memory less?
Option A:	$y(t) = 2x(t) + {}^{d}/_{dx}\, x(t)$
Option B:	$y(t) = 2x^2(t) + {}^{d}/_{dx}\, x(t)$
Option C:	$y(t) = \int x(t)dt$
Option D:	$y(t) = 2x^2(t)$
11.	An example for non-causal system is _____
Option A:	Amplifier
Option B:	Oscillator
Option C:	Rectifier
Option D:	Does not exist
12.	Find the Laplace transform of δ(t)
Option A:	1
Option B:	0
Option C:	∞
Option D:	2
13.	Find the Laplace transform of e^{-at} sin ωt u(t)

Option A:	$\frac{s+a}{(s+a)^2+\omega^2}$
Option B:	$\frac{s+a}{(s+a)^2-\omega^2}$
Option C:	$\frac{\omega}{(s+a)^2+\omega^2}$
Option D:	$\frac{\omega}{(s+a)^2-\omega^2}$
14.	Find x(∞) if X(s) is given by $\frac{s-2}{s(s+4)}$
Option A:	1
Option B:	-1
Option C:	0.5
Option D:	-0.5
15.	The Laplace transform of the function $e^{4t} + 5$ is _____
Option A:	$\frac{1}{s+4} + \frac{5}{s}$
Option B:	$\frac{1}{s-4} + \frac{5}{s}$
Option C:	$\frac{1}{s-4} - \frac{5}{s}$
Option D:	$\frac{1}{s+4} - \frac{5}{s}$
16.	The Laplace transform of the function cos(2t) + 7sin(2t) is _____
Option A:	$\frac{s-14}{s^2-14}$
Option B:	$\frac{s+14}{s^2-4}$
Option C:	$\frac{s-14}{s^2+4}$
Option D:	$\frac{s+14}{s^2+4}$
17.	Find the Z-transform of a^n u(n); a>0.
Option A:	$\frac{z}{z-a}$
Option B:	$\frac{z}{z+a}$
Option C:	$\frac{1}{1-az}$
Option D:	$\frac{1}{1+az}$
18.	Find the Z-transform of the causal sequence x(n) = {1,0,-2,3,5,4}. (1 as the reference variable)
Option A:	$1 - 2z^{-2} + 3z^{-3} + 5z^{-4} + 4z^{-5}$
Option B:	$1 - 2z^2 + 3z^3 + 5z^4 + 4z^5$
Option C:	$z^{-1} - 2z^2 + 3z^3 + 5z^4 + 4z^5$
Option D:	$z - 2z^3 + 3z^4 + 5z^5 + 4z^6$
19.	Find the Z-transform of x(n) = u(-n)
Option A:	$\frac{1}{z-1}$

Option B:	$\frac{1}{z+1}$
Option C:	$\frac{1}{1-z}$
Option D:	$-\frac{1}{z+1}$
20.	The z-transform of x[n]= {1,0,-1,0,1,-1} (1st 1 as the reference variable) is _____
Option A:	$1+2z^{-2}-4z^{-4}+5z^{-5}$
Option B:	$1-z^{-2}+z^{-4}-z^{-5}$
Option C:	$1-2z^{2}+4z^{4}-5z^{5}$
Option D:	$1-z^{2}+z^{4}-z^{5}$

Q2	
A	**Solve any Two** **5 marks each**
i.	Using Laplace transform, determine the natural response of the system described by the equation, $\frac{d^2y(t)}{dt^2} + 6\frac{dy(t)}{dt} + 5y(t) = \frac{dx(t)}{dt} + 4x(t)$; $y(0) = 1$; $\left.\frac{dy(t)}{dt}\right\|_{t=0} = -2$
ii.	Find the impulse response and step response of CT systems governed by the following transfer functions: $H(s) = (s+3)/(s^2+6s+8)$
iii.	Determine the Inverse Z-Transform of the following function: $X(z) = \frac{1}{1-1.5z^{-1}+0.5z^{-2}}$
B	**Solve any One** **10 marks each**
i.	Relation of ESD, PSD with auto-correlation
ii.	Find Laplace transform of $d/dt\ (sin(t)\ u(t))$

Q3	
A	**Solve any Two** **5 marks each**
i.	Determine if the system given by y(t) = t x(t) is memoryless, causal, linear, time invariant and stable.
ii.	Determine if the following signal is periodic. If yes, find the fundamental period. X(t)=5cos 4πt+3sin (8πt)
iii.	Perform convolution on following signals by graphical method. $x(t) = e^{-3t}\ u(t)$ and h(t) = t u(t)
B	**Solve any One** **10 marks each**
i.	Determine DTFS for the sequence $x(n)= \cos^2((\pi/8)n)$
ii.	State and Prove Parseval's Theorem with respect to DTFT.