

University of Mumbai
Examination 2021 under cluster 5 (Lead College: APSIT)

Examinations Commencing from 1st June 2021 to 11th June 2021.

Program: Electronics and Telecommunication Engineering

Curriculum Scheme: Rev2019

Examination: SE Semester IV

Course Code: ECC 404 and Course Name: Signals and Systems

Time: 2 hour

Max. Marks: 80

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	Which of the following responses of an LTI system does not depend on initial conditions?
Option A:	Natural response
Option B:	free response
Option C:	forced response
Option D:	total response
2.	Which of the following is an energy signal?
Option A:	$x(t)=A e^{j\Omega t}$
Option B:	$x(t)=A \sin \Omega t$
Option C:	$x(t)=B \cos \Omega t$
Option D:	$x(t)=e^{-at} u(t)$
3.	The Fourier transform of a function is equal to its two-sided Laplace transform evaluated _____
Option A:	On the real axis of the s-plane
Option B:	On the line parallel to the real axis of the s-plane
Option C:	On the imaginary axis of the s-plane
Option D:	On the line parallel to the imaginary axis of the s-plane
4.	The Fourier transform of a $x(t)= e^{7t} u(-t)$ function is given as:
Option A:	$F(j\omega) = 1/(7+j\omega)$
Option B:	$F(j\omega) = 7/(1+j\omega)$
Option C:	$F(j\omega) = 7/(1-j\omega)$
Option D:	$F(j\omega) = 1/(7-j\omega)$
5.	Find the Z-transform of $\delta(n+3)$.
Option A:	1
Option B:	z
Option C:	z^2
Option D:	z^3
6.	Find the Z-transform of $u(-n)$.
Option A:	$1/(1-z)$
Option B:	$1/(1+z)$
Option C:	$z/(1-z)$
Option D:	$z/(1+z)$

7.	For what kind of signals one sided z-transform is unique?
Option A:	All signals
Option B:	Anti-causal signal
Option C:	Causal signal
Option D:	Non-causal
8.	What is the one-sided z-transform of $x(n)=\delta(n-k)$?
Option A:	0
Option B:	1
Option C:	z^{-k}
Option D:	z^k
9.	Linear convolution between two sequences $x_1(n) = \{-1, 1, 2, -2\}$ and $x_2(n) = \{0.5, 1, -1, 2, 0.75\}$ is
Option A:	$\{-0.3, -0.6, 3, -2, -2.75, 6.75, -2.5, -1.6\}$
Option B:	$\{-0.1, -0.5, 3, -4, -2.75, 9.75, -2.5, -1.5\}$
Option C:	$\{-0.5, -0.5, 3, -2, -2.75, 6.75, -2.5, -1.5\}$
Option D:	$\{-0.5, -0.4, 1, -2, -2.75, 6.75, -2.5, -1.5\}$
10.	Find the final value, $x(\infty)$ in time domain for the s-domain signal $X(s)=s/(s^2+4)$.
Option A:	0
Option B:	1
Option C:	0.25
Option D:	1.25
11.	The convolution of $u(n)$ with $u(n-4)$ at $n=5$ is
Option A:	5
Option B:	2
Option C:	1
Option D:	0
12.	The samples of a cosine wave at zero frequency are equivalent to samples of
Option A:	Sine wave
Option B:	A DC signal
Option C:	A cosine wave
Option D:	An unknown signal
13.	Determine whether the signal, $x(t)=3 \cos \sqrt{2} t + 7 \cos 5 \pi t$ is periodic or not
Option A:	Non-Periodic
Option B:	Periodic
Option C:	Rational
Option D:	Irrational

14.	If input to a system is not bounded, then system is
Option A:	stable
Option B:	Unstable
Option C:	Cannot be tested
Option D:	ideal
15.	Which one of the following systems is causal?
Option A:	$y(t)=x(t)+x(t-3)+x(t^2)$
Option B:	$y(n)=x(n+2)$
Option C:	$y(t)=x(t-1)+x(t-2)$
Option D:	$y(n)=x(2n^2)$
16.	Find the Nyquist rate and Nyquist interval for the signal $f(t)=(\sin 500\pi t) / \pi t$.
Option A:	500 Hz, 2 sec
Option B:	500 Hz, 2 msec
Option C:	2 Hz, 500 sec
Option D:	2 Hz, 500 msec
17.	The impulse response $h(t)$ of an LTI system is given by $e^{-2t}u(t)$. What is the step response?
Option A:	$y(t) = \frac{1}{2} (1 - e^{-2t}) u(t)$
Option B:	$y(t) = \frac{1}{2} (1 - e^{-2t})$
Option C:	$y(t) = (1 - e^{-2t}) u(t)$
Option D:	$y(t) = \frac{1}{2} (e^{-2t}) u(t)$
18.	Fourier transform is evaluation of Laplace transform along the _____ axis in s-plane.
Option A:	Real
Option B:	Imaginary
Option C:	Z domain
Option D:	S domain
19.	Determine the convolution of $x_1(t)=e^{-2t}u(t)$ and $x_2(t)=e^{-6t}u(t)$, using Fourier Transform?
Option A:	$0.25(e^{-2t} - e^{-6t})u(t)$
Option B:	$0.15(e^{-2t} - e^{-6t})u(t)$
Option C:	$0.25(e^{-3t} - e^{-6t})u(t)$
Option D:	$0.35(e^{-2t} - e^{-5t})u(t)$
20.	In IIR systems, the _____ structure will give direct relation between time domain and z domain.
Option A:	Direct form-I
Option B:	Direct form
Option C:	Linear phase
Option D:	Direct form-II

Q2	Solve any Four out of Six	5 marks each
A	State and prove any two properties of Fourier Transform.	
B	Determine the following systems are memory less, causal, linear or Time invariant $y(t)=5x(t) +2$	
C	Using Laplace Transform, determine the natural response of the system represented by the following equations. $(d^2y(t)/dt^2) + 10 (dy(t)/dt) + 21 y(t) =8 x(t)$, $y(0)=2$, $(dy(t)/dt) = -3$ at $t=0$	
D	Explain in brief the ROC conditions in Laplace Transform.	
E	Determine the autocorrelation of the CT signal given by $x(t)=A \text{ rect } (t/2)$.	
F	The Impulse response of DT system is given by $h[n]= \{1,2,3\}$ and the output response is given by $y[n]= \{1,1,2,-1,3\}$, Using Z-Transform, determine $x[n]$ by long division method.	

Q3. (20 Marks Each)	Solve any Two Questions out of Three	10 marks each
A	Consider a causal LTI system with $H(j\omega) = (j\omega + 2)^{-1}$. For a particular input $x(t)$, this system produces output $y(t) = e^{-2t} u(t) - e^{-3t} u(t)$. Find out $x(t)$ using Fourier Transform.	
B	A LTI system has the following transfer function $H(z) = \frac{z}{(z - \frac{1}{4})(z + \frac{1}{4})(z - \frac{1}{2})}$ Give all possible ROC condition a) Show pole-zero diagrams b) Find impulse response of system c) Comment on the system stability and causality for all possible ROC's	
C	Obtain Inverse Laplace Transform of the function $X(s) = (3s+7)/(s^2 -s-12)$ for following ROCs, also comment on the stability and causality of the systems for each of the ROC conditions. Support your answer with appropriate sketches of ROCs. i. $Re(s) > 4$ ii. $Re(s) < -3$	

University of Mumbai
Examination 2021 under cluster 5 (Lead College: APSIT)

Examinations Commencing from 1st June 2021 to 11th June 2021.

Program: Electronics and Telecommunication Engineering

Curriculum Scheme: Rev2019

Examination: SE Semester IV

Course Code: ECC 404 and Course Name: Signals and Systems

Time: 2 hour

Max. Marks: 80

Question Number	Correct Option (Enter either 'A' or 'B' or 'C' or 'D')
Q1.	C
Q2.	D
Q3.	C
Q4	D
Q5	D
Q6	A
Q7	C
Q8.	C
Q9.	C
Q10.	A
Q11.	B
Q12.	B
Q13.	A
Q14.	B
Q15.	C
Q16.	B
Q17.	A
Q18.	B
Q19.	A
Q20.	A