

University of Mumbai
Examination Summer 2022

Program: EXTC

Curriculum Scheme: Rev2016

Examination: SE Semester IV

Paper Code: 40804, Course Code: ECC404 and Course Name: Signals and Systems

Time: 2 hour 30 minutes

Max. Marks: 80

Q1 (20 Marks)	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	The Laplace transform of the causal signal $t^n u(t)$ is
Option A:	$n! / s^{n+1}$
Option B:	$n! / s^n$
Option C:	n / s^{n+1}
Option D:	n / s^n
2.	The Fourier transform of $x(t) = e^{- t }$ is
Option A:	$2/(1-\Omega^2)$
Option B:	$2/(1+\Omega^2)$
Option C:	$1/(2+\Omega^2)$
Option D:	$1/(2-\Omega^2)$
3.	The Z-transform of $x(n) = -na^n u(-n-1)$ is
Option A:	$az/(z-a)^2$
Option B:	$(z(z+a))/(z-a)^3$
Option C:	$a^2 z^2 / (z-2a)^2$
Option D:	$az/(z+2a)^2$
4.	The convolution of a finite sequence with an infinite sequence
Option A:	May be a finite or infinite sequence
Option B:	Is always a finite sequence
Option C:	Is always an infinite sequence
Option D:	Cannot be found
5.	If Z-transform of $x(n)$ includes unit circle in its ROC, then the Fourier transform of $x(n)$ can be expressed as
Option A:	$\sum_{n=-\infty}^{\infty} x(n) z^{-n} \Big _{z=e^{-j\omega}}$
Option B:	$\sum_{n=0}^{\infty} x(n) z^{-n} \Big _{z=e^{-\omega}}$
Option C:	$\sum_{n=-\infty}^{\infty} x(n) z^n \Big _{z=\omega}$
Option D:	$\sum_{n=-\infty}^{\infty} x(n) z^{-n} \Big _{z=e^{j\omega}}$
6.	Find the inverse Laplace transform of 1

Option A:	1
Option B:	$\delta(t)$
Option C:	$\delta[n]$
Option D:	$u(t)$
7.	Find the Fourier transform of $-\delta(t)$
Option A:	1
Option B:	$\delta(f)$
Option C:	$-\delta(f)$
Option D:	-1
8.	Find the z transform of $(0.1)^n x[n]$
Option A:	$X(0.1z)$
Option B:	$0.1 X(z)$
Option C:	$X(10z)$
Option D:	$10 X(z)$
9.	The DTFS coefficients of a real and odd periodic signal are
Option A:	Real and odd
Option B:	Imaginary and even
Option C:	Real and even
Option D:	Imaginary and odd
10.	_____ should lie on the left half of s-plane for stability of a causal system.
Option A:	ROC
Option B:	Imaginary axis
Option C:	Zeros
Option D:	Poles

Q2 (20 Marks)	Solve any two out of three. 10 marks each
A	Find energy and average power of $A\cos\omega_0 t$
B	Find the autocorrelation function of $A\sin\omega_0 t$ and determine the average power from that.
C	Find the inverse Fourier transform of $X(j\Omega) = \frac{5}{1+j\Omega} - \frac{2.5}{0.98+j\Omega}$

Q3 (20 Marks)	Solve any two out of three. 10 marks each
A	Draw the direct form-I and II structures and signal flow graph of an IIR system with transfer function $H(z) = (2z^3 - 5z^2 + 7z - 12) / (z - 0.25)(z^2 - z + 0.5)$
B	Find the Z-transform of $x(n) = \frac{a^n \sin(n+1)\omega_0}{\sin(\omega_0)} u(n), \quad a < 1$
C	Using Laplace transform, determine the forced response of the system

	represented by the following equation: $d^2y(t)/dt^2 + 9 dy(t)/dt + 20 y(t) = 0.2 dx(t)/dt + 2 x(t)$, Input $x(t) = 6 u(t)$
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Q4 (20 Marks)	Solve any two out of three. 10 marks each
A	Find the ZT of $x[n] = e^{j\omega n} a^n u[n]$ and sketch the RoC
B	Find the IZT of $X[z] = z+2/(2z^2 -7z +3)$ for all possible ROCs using partial fraction method.
C	Find the Laplace transform of $x(t) = e^{bt} u(t)$, where $b > 0$, and sketch the RoC.