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Code No. : 13468 N

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS), HYDERABAD

Accredited by NAAC with A++ Grade

B.E. (E.C.E.) III-Semester Main Examinations, Jan./Feb.-2024

Signal Analysis and Transform Techniques

Time: 3 hours

Max. Marks: 60

Note: Answer all questions from Part-A and any FIVE from Part-B

Part-A (10 × 2 = 20 Marks)

Q. No.	Stem of the question	M	L	CO	PO	PSO
1.	Define Continuous time sinc signal.	2	1	1	1	3
2.	Determine the Average power of the signal $x(t) = 2\cos(5t)$.	2	2	1	2	3
3.	Find the Inverse Fourier Transform of $X(\omega) = e^{- \omega }$.	2	2	2	2	3
4.	State the Modulation property of the Fourier Transform.	2	1	3	1	3
5.	Find the Laplace Transform of the signal $x(t) = u(t+3) - u(t-3)$.	2	2	2	2	3
6.	What is the Nyquist rate of Sampling to be maintained to overcome the Aliasing effect for the signal $2 \text{sinc}(100\pi t) + 3 \text{sinc}(50\pi t)$.	2	3	4	2	3
7.	Write the equations to find even and odd parts of a discrete time signal $x[n]$?	2	1	4	1	3
8.	State the condition for stability and causality of a discrete time signal	2	1	1	2	3
9.	Find the Z – Transform of $-u[-n-1]$.	2	2	5	1	3
10.	Determine ROCs of Finite duration Right sided and finite duration Left sided signals?	2	2	5	2	3
Part-B (5 × 8 = 40 Marks)						
11. a)	The relation between the input $x(t)$ and output $y(t)$ of a continuous time system is given by $\frac{d^2y(t)}{dt^2} + 2y(t) \frac{dy(t)}{dt} + 3ty(t) = x(t)$ Check whether the given system is linear or non-linear, Time-invariant or time-variant and causal or non-causal?	4	2	1	2	3
b)	For the continuous time periodic signal $x(t) = 2 + \cos(2t) + \sin(4t)$, determine the fundamental frequency and the Trigonometric Fourier series Coefficients.	4	3	2	3	3
12. a)	Find the response of a continuous time system with input $x(t) = e^{-3t}u(t)$. and impulse response $h(t)=u(t)-u(t-1)$.	4	2	2	3	3
b)	Determine the Fourier Transform of the signals given below. i) $x(t) = e^{-3t}u(t - 2)$ ii) $x(t) = \delta(t + 2) + \delta(t + 1) + \delta(t - 1) + \delta(t - 2)$	4	3	2	2	3

Contd... 2

13. a)	Find the Inverse Laplace Transform of $X(S) = \frac{1}{(S+1)(S+2)(S+3)}$, if ROC is i) $\text{Re}\{S\} > -1$ ii) $\text{Re}\{S\} < -3$ iii) $-3 < \text{Re}\{S\} < -2$	4	3	3	3	3
b)	What is Aliasing Effect? What are different ways to overcome Aliasing Effect, Explain?	4	2	4	2	3
14. a)	A discrete time signal is given as $x[n] = 2n+1$ for $-3 \leq n \leq 3$ and zero otherwise. Give the graphical representation of the following signals. i) $x[-n]$ ii) $x[n-2]$ iii) $x[2n]$	4	1	1	1	3
b)	Determine the Discrete Time Fourier Transform (DTFT) of unit step signal?	4	3	4	3	3
15. a)	Find the Z – Transform of the signal $x[n] = \sin(\omega_0 n)u[n]$, also draw ROC in Z – plane.	4	3	5	2	3
b)	A Discrete time causal LTI system is described by difference equation $y[n] - y[n-1] - 2y[n-2] = x[n-1] + 2x[n-2]$. Determine the impulse response and Step response of the system using Z – Transform.	4	3	3	3	3
16. a)	Define a Continuous time Periodic Signal? Check whether the following signals are Periodic or Aperiodic, also find the fundamental time period? i) $x(t) = \cos(6t) + 3\sin(8t) + e^{j2t}$ ii) $x(t) = 8\cos(4\pi t)\cos(6\pi t)$	4	3	1	2	3
b)	Define Transfer function of LTI system and write all its properties.	4	1	3	2	3
17.	Answer any <i>two</i> of the following:					
a)	State and Prove the Initial Value Theorem of Laplace Transform?	4	2	2	1	3
b)	Describe a linear time invariant discrete system. Mention the role of impulse response in it.	4	2	3	2	3
c)	Using Residue method find $x[n]$ for $X(Z) = \frac{1+2Z^{-1}}{1+4Z^{-1}+3Z^{-2}}$ if ROC is $ Z > 3$	4	2	5	2	3

M : Marks; L: Bloom's Taxonomy Level; CO; Course Outcome; PO: Programme Outcome

i)	Blooms Taxonomy Level – 1	20%
ii)	Blooms Taxonomy Level – 2	40%
iii)	Blooms Taxonomy Level – 3 & 4	40%
