Code No. : 14426

VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD
B.E. (E.C.E. : CBCS) IV-Semester Main Examinations, January-2021
Signal Analysis and Transform Techniques

Time: **2 hours**   Max. Marks: **60**

Note: Answer any NINE questions from Part-A and any THREE from Part-B

Part-A (9× 2 = 18 Marks)

Q. No.	Stem of the question	M	L	CO	PO
1.	Define Energy and Power signals?	2	1	1	1
2.	Write the relation between Exponential and Trigonometric Fourier Series coefficients	2	2	1	1,2
3.	If the Fourier transform of $x(t)$ is $X(\omega)$, what is the Fourier transform of $x(at)$?	2	3	2	1,2
4.	State the condition for a system to be causal interms of impulse response?	2	2	2	1
5.	Write the applications of Laplace Transforms with respect to Communication Engineering.	2	2	2	1
6.	A Signal having a Spectrum ranging from near **dc to 10KHz** is to be sampled and converted to discrete form. What is the minimum number of samples per second that must be taken to ensure recovery?	2	3	4	1,2
7.	The impulse response for Discrete LTI System is given by $h(n) = \delta(n) + \cos n\pi$, Check for Stability.	2	3	3	1,2
8.	Write the properties of Linear convolution.	2	1	3	1
9.	Determine the Z Transform of the signal $x(n) = \delta(n-2) + \delta(n+3)$.	2	2	5	1
10.	Bring out the relationship between S-plane and Z-plane	2	3	5	1,2
11.	Determine the Fundamental time period of a signal $x(t) = 2\cos(4\pi t) + 3\sin(6\pi t)$.	2	3	1	1,2
12.	Write the conditions for the distortionless transmission through a LTI system?	2	3	3	1

Part-B (3 × 14 = 42 Marks)

13. a)	Construct signal x(t) using suitable elementary signals, express x(t) in terms of the same and explain?	7	2	1	1,2
b)	Explain Time Shifting, Time Scaling, and Time Reversal operations on a continuous time signal x(t) with suitable examples?	7	2	1	1,2

			M	L	CO	PO
14.	a)	Obtain the Fourier transform of the Signal $$x(t) = r(t + 2) - r(t + 1) - r(t - 1) + r(t - 2)$$	7	3	2	1,2
	b)	Explain how input and output signals are related to impulse response of a LTI system. Also write the properties of LTI system?	7	2	3	1,2
15.	a)	A Signal x(t) has Laplace transform $$X(S) = \frac{S + 2}{S^2 + 4S + 5}$$ Find Laplace transform of the following signals: i) $\quad y(t) = tx(t) \qquad$ ii) $\quad z(t) = e^{-t}x(t)$	8	3	2	1,2
	b)	Distinguish between Instantaneous sampling, Natural sampling and Flat top sampling?	6	2	4	1,2
16.	a)	Define Discrete time Event Signals and derive the equations to find the Even and Odd parts of a Discrete time signal x(n) .	6	2	1	1,2
	b)	Find the DTFT of the following sequences i) $\quad x(n) = n \, 0.5^n u(n) \qquad$ ii) $\quad y(n) = \left(\frac{1}{4}\right)^n u(n - 1)$.	8	3	5	1,2
17.	a)	Determine the Z-transform and ROC of the Discrete time signal $$x(n) = 2 \left(\frac{5}{6}\right)^n u(-n - 1) + 3 \left(\frac{1}{2}\right)^n u(n) .$$	8	3	5	1,2
	b)	Explain the procedure to determine the Inverse Z Transform of X(Z) using Long Division Method with suitable example?	6	2	5	1,2
18.	a)	Check whether the given systems are Linear, Time Invariant and Causal. i) $\qquad y(t) = e^{x(t)} + x(t + 1) \qquad$ ii) $\qquad y(t) = \log_{10} x(t)$	8	3	1	1,2
	b)	Obtain the impulse response of the system described by the following equation $\quad \frac{d^2 y(t)}{dt^2} + 3\frac{dy(t)}{dt} + 2y(t) = 2x(t) + \frac{dx(t)}{dt}$	6	3	3	1,2
19.		Answer any *two* of the following :				
	a)	State Sampling theorem and discuss Aliasing with an example.	7	2	4	1,2
	b)	Bring out the relationship between DFS and DTFT	7	2	5	1,2
	c)	Prove the following with respect to Z-transform. i) $\quad$ Time Shift Property ii) $\quad$ ROC of an finite non causal sequence is entire Z-Plane except $Z=\infty$	7	2	5	1,2

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

S. No.	Criteria for questions	Percentage
1	Fundamental knowledge (Level-1 & 2)	56 %
2	Knowledge on application and analysis (Level-3 & 4)	44 %
3	*Critical thinking and ability to design (Level-5 & 6) (*wherever applicable)	0 %

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