Q. Code:688928

Reg. No. | | | | | | | | | | | | | |

B.E. / B.TECH. DEGREE EXAMINATIONS, MAY 2024

Fourth Semester

EC18402 – SIGNALS AND SYSTEMS

(Electronics and Communication Engineering)

(Regulation 2018 / 2018A)

TIME: 3 HOURS **MAX. MARKS: 100**

COURSE OUTCOMES	STATEMENT	RBT LEVEL
CO 1	Classify signals and systems based on their properties.	**3**
CO 2	Infer the spectral characteristics of continuous time signals by applying Fourier and Laplace transform.	**3**
CO 3	Use the principles of Fourier transform and Z transform to analyze the characteristics of discrete time signals.	**3**
CO 4	Determine the response of continuous and discrete time LTI systems.	**3**
CO 5	Illustrate the process of sampling and the effects of under and over sampling.	**3**

PART- A (10 x 2 = 20 Marks)

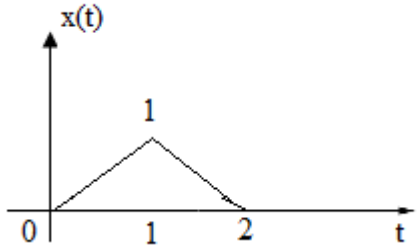
(Answer all Questions)

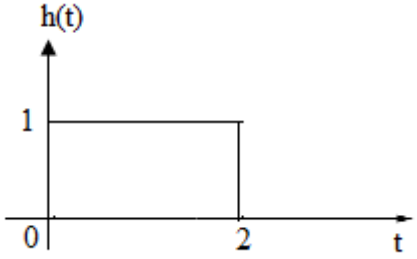
		CO	RBT LEVEL
1.	Sketch the signal $x[n]=u[n-2]+u[n+2]$.	**1**	**3**
2.	Give the relation between unit impulse function δ(t), unit step function u(t) and unit ramp function r(t).	**1**	**3**
3.	Find the Fourier transform of $x(t)=\delta(t-t_0)$.	**2**	**3**
4.	Determine the initial and final values of a signal x(t) whose unilateral Laplace transform is $X(s)=\frac{7s+10}{s(s+2)}$.	**2**	**3**
5.	Check whether the system $h(t)=e^{-4t}u(-t)$ is stable or not.	**4**	**5**
6.	Determine the frequency response of the system described by the equation $\frac{d^2y(t)}{dt^2}+6\frac{dy(t)}{dt}-5y(t)=6x(t)$	**4**	**3**
7.	State the need for sampling.	**5**	**1**
8.	Find the Z-transform and its associated ROC for x[n] = {1, -1, 3, 2, 4}	**3**	**3**
9.	Write any two properties of convolution sum.	**4**	**2**
10.	Compare recursive and non recursive system.	**4**	**3**

PART- B (5 x 14 = 70 Marks)

		Marks	CO	RBT LEVEL
11. (a)	Determine whether the signal is a power signal (or) energy signal (or) neither.	**(14)**	**1**	**3**
	i. $x(t)=e^{j\left(2t+\left(\frac{\pi}{4}\right)\right)}$			
	ii. $x[n]=\begin{cases}\left(\frac{1}{2}\right)^n & n\geq 0\\ (3)^n & n<0\end{cases}$			
	(OR)			
(b)	Check whether the following systems are Linear or Nonlinear, Time variant or Invariant, Causal or Non-causal, BIBO Stable or Unstable.	**(14)**	**1**	**3**
	i. $y(t)=t\,x(2t)+x(t-3)$			
	ii. $y[n]=x[n+2]+x[-n-2]$			
12. (a)	Determine the Fourier transform of a signal $x(t)=e^{-2\vee t\vee}$ and also sketch its magnitude and phase reponse.	**(14)**	**2**	**3**
	(OR)			
(b)	Determine the signal $x(t)$ whose bilateral Laplace transform, $X(s)=\frac{3s+7}{s^2-2s-3}$ for the following ROCs.	**(14)**	**2**	**3**
	(i) $\Re\{s$¿>3 (ii) $\Re\{s\}\leftarrow 1$ (iii) $-1<\Re\{s\}<3$			
13. (a)	Consider a continuous time LTI system for which the input x(t) and output y(t) are related by, $\frac{d^2y(t)}{dt^2}-\frac{dy(t)}{dt}-2y(t)=x(t)$	**(14)**	**4**	**3**
	(a) Find the system function, H(s)			
	(b) Determine the impulse response h(t) for the following cases:			
	i) System is Causal			
	ii) System is Stable			
	iii) System is neither Causal nor Stable			
	(OR)			

(b) Find the convolution of the given signals using graphical method.





(14) 4 3

14. (a) **(i)** What is the minimum sampling frequency required for the given continuous time signal $x(t)=200\sin(400t).\sin(500t)$ to avoid aliasing? **(6) 5 3**

(ii) Determine the Discrete Time Fourier transform of the following signal. **(8) 3 3**

$$x[n]=\left(\frac{1}{2}\right)^{n-1}u[n-1]$$

(OR)

(b) **(i)** Consider the signal $x(t)=e^{-t}$ for an interval $0\le t\le 2$, sample the signal with a sampling period T = 0.2s and sketch the discrete time signal. **(6) 5 3**

(ii) Determine the Z transform and their ROC of the discrete time signal $x[n]=0.4^{|n|}$. **(8) 3 3**

15. (a) **(14) 4 3**

Determine the response of the system governed by difference equation $y[n]=0.7\,y[n-1]-0.12\,y[n-2]+x[n-1]+x[n-2]$ to the input $x[n]=nu[n]$.

(OR)

(b) **(14) 4 3**

Convolve the following signal:

$x[n]=(0.5)^{n-2}u[n-2]$

$h[n]=u[n+2]$

PART- C (1 x 10 = 10 Marks)

(Q.No.16 is compulsory)

		Marks	CO	RBT LEVEL
16.	Determine whether or not each of the following signals is periodic. If a signal is periodic, specify its fundamental period.	**(10)**	**1**	**3**

i. $x(t)=\cos^2\left(2t-\left(\frac{\pi}{3}\right)\right)$

ii. $x[n]=e^{j\frac{3}{5}\left(n+\frac{1}{2}\right)}$