Roll No.												

PRESIDENCY UNIVERSITY

BENGALURU

End - Term Examinations – December 2025

Date: 16 – 12- 2025 **Time:** 09:30am – 12:30pm

School: SOE	**Program:** B.Tech ECE	
Course Code: ECE2020	**Course Name:** Signals and Systems	
Semester: III	**Max Marks**: 100	**Weightage**: 50%

CO - Levels	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Marks					

Instructions:

(i) Read all questions carefully and answer accordingly.

(ii) Do not write anything on the question paper other than roll number.

Part A

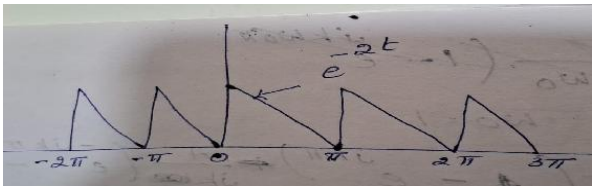
Answer ALL the Questions. Each question carries 2marks. **10Q x 2M=20M**

1.	Show that signum function sgn(t) = 2u(t) - 1	**2 Marks**	**L1**	**CO1**
2.	Complete the statement with respect to convolution $\delta(n-k) * \delta(n-m) =$	**2 Marks**	**L1**	**CO2**
3.	Find the exponential Fourier series coefficients of $X(t) = \sin w_0 t + \cos(2w_0 t)$	**2 Marks**	**L1**	**CO3**
4.	What do you mean by magnitude and phase spectrum with respect to Fourier Transform	**2 Marks**	**L1**	**CO3**
5.	Prove that Fourier coefficients are periodic	**2 Marks**	**L1**	**CO4**
6.	List the properties of Fourier transform	**2 Marks**	**L1**	**CO4**
7.	Bring out the importance of Parseval's theorem along with the mathematical equation	**2 Marks**	**L1**	**CO4**
8.	What is the key advantage of FIR filter	**2 Marks**	**L1**	**CO6**
9.	What is FIR and IIR filter	**2 Marks**	**L1**	**CO6**
10.	Find the Z transform of the sequence x[n] = [1,2,3,0,-1,-2,-3] and comment on ROC ^	**2 Marks**	**L1**	**CO6**

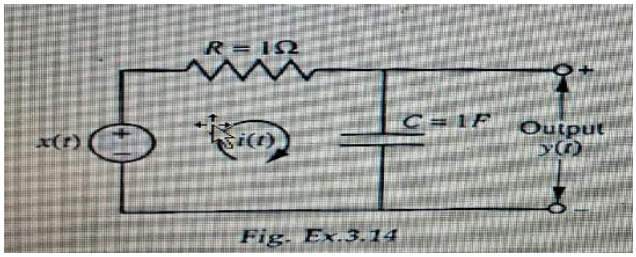
Part B

Answer the Questions. **Total Marks 80M**

11.	**a.**	Find whether the given signals are power signals or energy signals a) $x(t) = e^{-at}\,[u(t) - u(t-7)]$ **b)** $x(t) = t\,u(t)$	**10 Marks**	**L2**	**CO1**
	b.	Sketch unit ramp signal r(t) and r[n]	**5 Marks**	**L2**	**CO1**
	c.	Apply the graphical method to find the response of following DT LTI system X[n] = [1, 2, 3, 4, 5] $\wedge$ H[n]= [1,2,3] $\wedge$	**5 Marks**	**L3**	**CO2**
		Or			
12.	**a.**	Determine whether the following systems are liner or non-linear a) $d^2y(t)/dt^2 + 2\,dy(t)/dt + y(t) = x(t)$ b) $y(t) = t\,x^2(t)$	**10 Marks**	**L2**	**CO1**
	b.	If x[n]=[6,4,2,1,2,4,6] sketch x[-2n] and x[-n-3]	**5 Marks**	**L2**	**CO1**
	c.	Apply the graphical method to find the response of following DT LTI system (a) X[n] = [2, 4, 6, 8, 10] $\wedge$ H[n] = [1, 1, 1] $\wedge$	**5 Marks**	**L3**	**CO2**

13.	**a.**	Apply the appropriate procedure to convolute the following two continuous time signals. $x1(t) = e^{-2t}$ and $x2(t) = u(t+2)$	**10 Marks**	**L2**	**CO2**
	b.	Obtain the exponential Fourier Series representation of the waveform x(t) shown below 	**10 Marks**	**L3**	**CO3**

		Or			
14.	**a.**	Apply the appropriate procedure to convolute the following two continuous time signals. $X1(t) = \cos \pi t[u(t+1) - u(t-3)]$ and $x2(t) = u(t)$	**10 Marks**	**L2**	**CO2**
	b.	Consider a periodic wave form $x(t) = 4 + 2\cos 3t + 3\sin 4t$. a) What is the value of T b) What is the total average power c) Find complex Fourier coefficients Apply Parseval's theorem, find power spectrum and Verify the Parseval's theorem	**10 Marks**	**L3**	**CO3**

15.	**a.**	Find the Fourier Transform of the following functions a) The unit impulse function b) The decaying exponential function c) The rectangular function	**10 Marks**	**L3**	**CO4**
	b.	Discuss on the properties of ROC	**10 Marks**	**L4**	**CO5**
		Or			
16.	**a.**	For the network shown below, find and sketch the response of the system when the input is $\delta(t)$ for the purpose of analysis  Fig. Ex.3.14	**10 Marks**	**L3**	**CO4**
	b.	Discuss on the properties of Z transform along and analyze the same with the concept of ROC	**10 Marks**	**L4**	**CO5**

17.	**a.**	A system is described by the difference equation $y[n] - 2y[n-1] + y[n-2] = x[n]$ with zero initial conditions. Apply Z transform to get the response of the system h[n] required for the analysis	**10 Marks**	**L4**	**CO5**
	b.	A filter is described by the difference equation $Y[n]=0.52x[n]+0.77x[n-1]+ 0.12x[n-2]+ 0.65x[n-3]$. Analyze this equation to obtain the impulse response to recognize the type of filter . Justify your answer. Write the Z transform of the resultant impulse response.	**10 Marks**	**L4**	**CO6**

		Or			
18.	**a.**	A system is described by $x[n] = a^n \sin(\Omega n)u[n]$. Apply the Z transform to the above system to get the response required for analysis.	**10 Marks**	**L4**	**CO5**
	b.	A system is described by the difference equation $Y[n]=0.35x[n]+0.17x[n-1]+ 0.85x[n-2]+ 0.67x[n-3]$. Analyze this equation to obtain the impulse response to recognize the type of filter . Justify your answer. Write the Z transform of the resultant impulse response.	**10 Marks**	**L4**	**CO6**