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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIFTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017

Course Code: EE307

Course Name: SIGNALS AND SYSTEMS (EE)

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries5 marks. Marks

1	Define unit step function and plot x(t) and x(2t), if x(t) = u(t+2) - u(t-2)	(5)
2	Find the unilateral Laplace Transform of ramp function $r(t) = t\,u(t)$. Specify the region of convergence	(5)
3	Explain the Dirichlet's condition for the existence of Fourier Transform	(5)
4	Define and plot the discrete time ramp signal r(n). Also plot r(n-2).	(5)
5	Prove that the sequences $x(n) = a^n u(n)$ and $x(n) = -a^n u(-n-1)$have the same X(z) and differ only in ROC	(5)
6	State and prove the convolution property of Z- transform	(5)
7	Prove that the discrete Fourier series coefficient $C_k = \frac{1}{N}\sum_{n=0}^{(N-1)} x(n)e^{\frac{-j2\pi kn}{N}}$ for k=0,1,2...,N-1	(5)
8	Write the Fourier series representation of a discrete time periodic signal with periodicity N. What is the difference between continuous time and discrete time Fourier series?	(5)

PART B

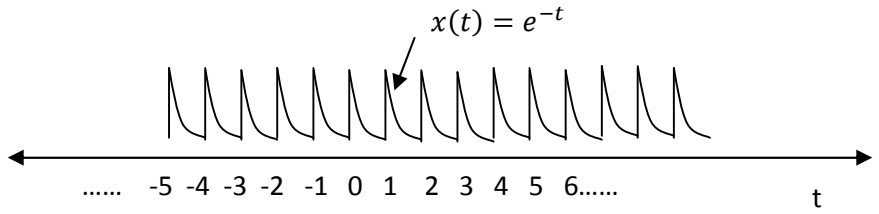
Answer any twofull questions, each carries10 marks.

9	a)	Check whether the given signal x(t) is energy or power signal. Find the energy and power of the signal. $x(t) = e^{-5t}u(t)$	(4)
	b)	The impulse response of a LTI system is $h(t) = (2 + e^{-3t})\,u(t)$.Check whether the system is (i) Stable or unstable (ii) Causal or non causal (iii)Memory or memory less	(6)
10	a)	Find the response of a LTI system with impulse response $h(t) = e^{-2t}u(t)$ for an input $x(t) = t\,u(t)$.	(4)
	b)	Check whether the system $y(t) = x(t)\,x(t-1)$ is i) Linear or Non linear ii) Causal or Non causal iii) Time invariant or Time variant	(6)
11		For the following system described by differential equation, find the impulse response, if the system is (i) stable (ii) causal $$\frac{d^2y(t)}{dt^2} + 5\frac{dy(t)}{dt} + 6y(t) = \frac{d^2x(t)}{dt^2} + 8\frac{dx(t)}{dt} + 13x(t)$$ Assume initial conditions as zero.	(10)

PART C

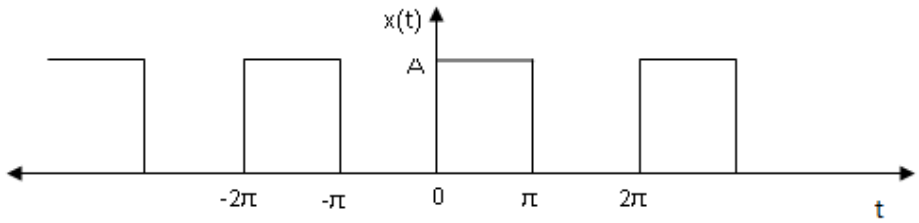
Answer any twofull questions, each carries10 marks.

12 Find the exponential Fourier series of the given signal. Plot the magnitude and phase spectrum. (10)



13 a) Find the Fourier transform of the signal $x(t) = e^{-at}u(t)$ (4)

b) Obtain the trigonometric Fourier series of the following signal (6)



14 a) State and prove Sampling Theorem (5)

b) Using matrixmethod find the convolution of$x[n] = \{1, 4, 3, 1\}$and $h[n] = \{1, 2, 3, 2\}$ (5)

PART D

Answer any twofull questions, each carries 10 marks.

15 a) Find the z-transform and ROC of $x(n) = \left(\frac{1}{3}\right)^n u(n)$ (4)

b) Find the inverse Z-transform of $X(z) = \frac{3z^{-1}}{(1-z^{-1})(1-2z^{-1})}$if (6)

i) ROC is $|z| > 2$ii) ROC is $|z| < 1$

16 An LTI system is described by the difference equation (10)

$$y(n) - \frac{9}{4}y(n-1) + \frac{1}{2}y(n-2) = x(n) - 3x(n-1)$$

Specify the ROC of H(z), and determine h(n) for the following conditions

i) The system is stable ii) The system is causal

17 Determine the Fourier series representation of the following discrete time signal and sketch the frequency spectrum (10)

x(n)={.....1,2,-1,1,2,-1,1,2,-1.....}

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