Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Fifth semester B.Tech degree examinations (S) September 2020

Course Code: EE307

Course Name: SIGNAL AND SYSTEMS

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries5 marks. Marks

1		Check whether the given signal $x(t) = e^{-3t}u(t)$ is an energy or power signal.	(5)
2		Find the ROC of the signal $x(t) = e^{-b\|t\|}$ using Laplace transform.	(5)
3		State and prove the convolution property of Fourier transform.	(5)
4		Briefly explain sampling process and sampling theorem.	(5)
5		Find the initial and final values of $X(z) = \frac{(2z+4)(3z+5)}{(z+2)(4z+5)}$.	(5)
6		State and prove time delay theorem of Z transform.	(5)
7		Find the DTFT of the sequence $x(n) = 5nu(n)$.	(5)
8		Explain different types of nonlinearities present in the system.	(5)

PART B

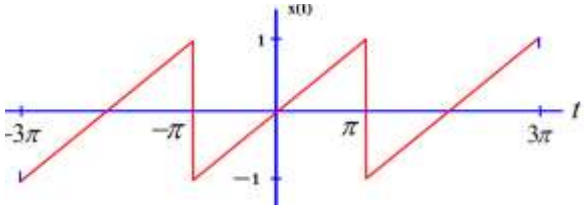
Answer any two full questions, each carries10 marks.

9		Briefly explain the classification of different types of systems with example.	(10)
10	a)	A continuous time LTI system is described by the differential equation $\frac{d^2y(t)}{dt^2} - \frac{dy(t)}{dt} - 2y(t) = x(t)$. Find the impulse response using Laplace transform, if the system is stable . Assume zero initial conditions.	(5)
	b)	Find the inverse Laplace transform of $X(s) = \frac{2}{(s+4)(s-1)}$ if ROC is i) Re(s) >1 ii) Re(s) <-4 iii) -4 < Re(s) <1	(5)
11	a)	Determine whether the system $y(t) = t^2x(t-1)$ is linear, time invariant or both.	(6)
	b)	Check whether the given signal $x(t) = 2\cos(10t+1) - \sin(4t-1)$ is periodic or not and find the fundamental period if the signal is periodic.	(4)

PART C

Answer any two full questions, each carries 10 marks.

12 Obtain the trigonometric Fourier series representation of the waveform shown below. (10)



13 a) Briefly explain sampling theorem and signal reconstruction. (4)

b) Find the output signal $y(n)$ if the input sequence is $x(n) = \{1,4,3,2\}$ and $h(n) = \{1,3,2,1\}$. (6)

14 The input and output of a causal LTI system is related by the differential equation $\frac{d^2y(t)}{dt^2} + 6\frac{dy(t)}{dt} + 8y(t) = 2x(t)$. Find the impulse response of the system and also find the unit step response if $x(t) = te^{-2t}u(t)$. (10)

PART D

Answer any two full questions, each carries 10 marks.

15 a) State and prove properties of Z transform. (10)

16 a) Find the DTFS representation for $x(n) = 5 + \sin\frac{n\pi}{2} + \cos\frac{n\pi}{4}$. (5)

b) Evaluate the integral $\int_{-\pi}^{\pi} \left| \frac{1}{1 - \frac{e^{-j\omega}}{4}} \right|^2 d\omega$ using Fourier transform (5)

17 a) Find the inverse Z transform $X(z) = \frac{z}{(z-1)(z-2)(z-3)}$ using partial fraction method. (6)

b) Find the Z transform and ROC of the signal $x(n) = a^n u(n)$. (4)

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