Name:

Enrolment No:

UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2018

Course: B. Tech Electronics and Communication **Semester: III**

Programme: Signal and System

Time: 03 hrs. **Max. Marks: 100**

Instructions:

SECTION A

S. No.	Attempt all the questions.	**Marks**	
Q 1	Determine whether the following signals are power or energy signals or neither. (a) x(t)= $e^{-5t}u(t)$ (b) $x(n)=u(n)-u(n-6)$	**5**	**CO1**
Q 2	Consider a continuous time system with input x(t) and output y(t) related by y(t) =x sin(t) (a) Is this system Causal? (b) Is this system linear ?	**5**	**CO2**
Q 3	What is the relation between laplace transform and fourier transform?	**5**	**CO3**
Q 4	What is the condition for Z Transform the exist?	**5**	**CO3**

SECTION B

	Attempt all the question		
Q5	A causal system is described by the difference equation $y(n)-ay(n-1)=bx(n)+x(n-1)$, where a is a real and less than 1 in magnitude. Find a value of b such that the frequency response of the system satisfies $\lvert H(e^{jw})\rvert=1$, for all w.	**10**	**CO3**
Q 6	Find the convolution of the signal $x_1=2e^{-2t}u(t)$ and $x_2=u(t)$ using Fourier transform?	**10**	**CO2**
Q 7	The impulse response of a continuous system is expressed as $h(t)=\frac{1}{RC}e^{\frac{-t}{RC}}u(t)$ Find the frequency response of a system. Plot the frequency response.	**10**	**CO3**
Q 8	Determine the z transform of the anticausal signal x(n) = - a^nu (-n-1) and depict the ROC and the locations of poles and zeros in the z plane.	**10**	**CO4**

SECTION-C

	Attempt all the question.		
Q 9 (a)	Use the unilateral Laplace transform to determine the output of a system represented by the differential equation	**10**	**CO3**

(b)	$\frac{d^2y(t)}{dt^2}+5\frac{dy(t)}{dt}+6y(t)=\frac{dx(t)}{dt}+6x(t)$ In response to the input x(t) =u(t). Assume to the initial condition on the system are y(0^-) = 1 and $\dot{y}(0^-)$=2 . Identify the zero state response of the system and the zero input response. Find the Fourier Transform of the following periodic signal $x(n)=\sin(w_0 n)$ with $w_0=\frac{2\pi}{5}$	**10**	
Q 10	A causal discrete time LTI system is described by $y(n)-\frac{3}{4}y(n-1)+\frac{1}{8}y(n-2)=x(n)$ Where x(n) and y(n) are the input and output of the system, respectively (a) Determine the system function H(z) for a causal system function. (b) Find the impulse response h(n) of the system. (c) Find the step response of the system	**20**	**CO4**

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SECTION A

S. No.	Attempt all the questions.	**Marks**	
Q 1	Find whether the following systems are (1) Static and Dynamic (2)Linear and Non Linear (3) Causal and Non causal (4) Time invariant and time Variant (a) Y(t) = | x(t)|	**5**	**CO1**
Q 2	The signals $x_1(t) = 10\cos(100\pi t)$ and $x_2(t) = 10\cos(50\pi t)$ are both sampled with $f_s = 75$ Hz. Show that the two sequences of samples so obtained are identical.	**5**	**CO1**
Q 3	What is the relation between laplace transform and fourier transform?	**5**	**CO3**
Q 4	What do you understand by frequency Spectrum of a signal?	**5**	**CO1**

SECTION B

	Attempt all the question		
Q5	Determine whether the following signals are power or energy signals or neither. (a) x(t)= $e^{-a\|t\|}$ (b) x(t)= u(t)	**10**	**CO1**
Q 6	Find the convolution of the signal $x_1 = 2e^{-2t}u(t)$ and $x_2 = u(t)$ using Fourier transform?	**10**	**CO2**
Q 7	Find the signal x(t) that corresponds to the Laplace transform $X(s) = \frac{3s^2 + 22s + 27}{(s^2 + 3s + 2)(s^2 + 2s + 5)}$	**10**	**CO2**
Q 8	Determine the z transform of the anticausal signal x(n) = a^n u (-n-1) and depict the ROC and the locations of poles and zeros in the z plane.	**10**	**CO4**

SECTION-C			
	Attempt all the question.		
Q 9 (a)	Consider a continuous time LTI system for which the input x(t) and output y(t) are related by the differential equations $$\frac{d^2y(t)}{dt^2} - \frac{dy(t)}{d(t)} - 2y(t) = x(t)$$ Let X(s) and Y(s) denote the laplace transform of x(t) and y(t) , respectively and let H(S) denote the laplace transform of h(T), the system impulse response. (a) Determine H(s) as a ration of two polynomial in s. Sketch the Pole zero pattern of H(s) (b) Determine h(t) for each of the following cases. 1. The system is stable 2. The system is causal 3. The system is neither stable nor causal.	**20**	**CO3**
Q 10	An LTI system is characterized by the system function $$H(z) = \frac{3 - 4z^{-1}}{1 - 3.5z^{-1} + 1.5z^{-2}}$$ Specify the ROC of H(z) and determine h (n) for the following conditions: (a) The system is causal and unstable (b) The system is noncausal and stable	**20**	**CO4**