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

Question Paper Code: 94403

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2024

Fourth Semester

Electronics and Communication Engineering

19UEC403– SIGNALS AND SYSTEMS

(Regulation 2019)

Duration: Three hours | Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 1 = 5 Marks)

1. A resistive-capacitive network is a _____system. CO1-U

   (a) causal & static (b) Non causal & static

   (c) causal &dynamic (d) Non causal &dynamic

2. Which of the following signal can be analyzed by Fourier Transform? CO1-U

   (a) Periodic (b) aperiodic (c) Both (d) none of the above

3. CO3-App

   If $F(s) = L[f(t)] = \frac{2(s+1)}{s^2+4s+7}$ then the initial value of the signal is

   (a) 0 (b) 2 (c) ½ (d) infinity

4. If the signal $x(t) = cos(2000\pi t)$ is sampled at 5000 Hz such that $x(n)=x(nT_s)$, what is the fundamental frequency of x(n) in rad/sec? CO4- App

   (a) $2\pi/5$ (b) π (c) $2\pi/8$ (d) $\pi/8$

5. The ROC X(z) cannot contain any CO1- U

   (a) poles (b) zeros (c) poles or zeros (d) multiple poles

PART – B (5 x 3= 15 Marks)

6. Relate the impulse signal, step signal and ramp signal. CO1- U

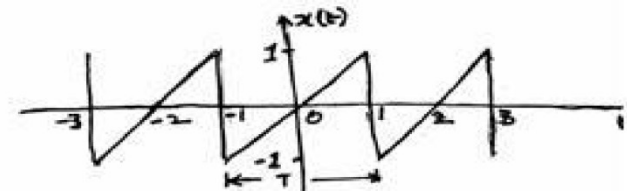
7. Obtain the Fourier Transform of $sin\ w_0t$. Draw its magnitude spectrum CO3- App

8. Derive the L.T. of the signal u(t)* u(t-1) using the convolution property CO3-App

9. State sampling Theorem. CO1-U

10. Define ROC**.** Illustrate the Z-transform pair. CO1-U

PART – C (5 x 16= 80 Marks)

11.	(a)	Describe the properties of CT and DT systems in detail with neat sketch.	CO1- U	(16)
		Or		
	(b)	Check all the system properties for the given $(i)\ y(n) = x(n+1) - x(n-1)$ $(ii)\ \frac{dy(t)}{dt} + 5ty(t) = x(t)$	CO2- App	(16)
12.	(a)	Find the trigonometric Fourier series for the periodic signal x(t) shown in figure.	CO3-App	(16)
				
		Or		
	(b)	Find the Fourier transform of a rectangular pulse of duration T with amplitude A and draw its spectrum	CO2- App	(16)
13.	(a)	An LTI system is defined by differential equation $\frac{d^2y(t)}{dt^2} - 4\frac{dy(t)}{dt} + 5y(t) = 5x(t)$. Find the response of the system y(t) using L.T. for an input x(t)=u(t) , if the initial conditions are *y(0)=1; y'(0)=2.*	CO3- App	(16)
		Or		
	(b)	Determine the Laplace Transform for double exponential function given by $x(t)=e^{-2\|t\|}$; also plot its region of convergence.	CO3- App	(16)
14.	(a)	A signal ***x(t)= SinC(150πt)*** is sampled at a rate of a.100Hz b.200 Hz c.300 Hz. For each of these three cases, Explain if you can recover the signal x(t) from the sampled signal.	CO4- Ana	(16)
		Or		

(b) A pressure gauge that can be modeled as an LTI system has a time response to a unit step input given by $(1-e^{-t}-te^{-t})u(t)$. For a certain input x(t), the output is observed to be $(2-3e^{-t}+e^{-3t})u(t)$. For this observed measurement, determine the true pressure input to gauge as a function of time. CO3- Ana (16)

15. (a) Realize the direct form I and direct form II structure for the given difference equation. Comment on the results obtained . CO6- E (16)

y(n) - 6 y(n-1) + 6 y(n-2) = x(n)+3x(n-2).

Or

(b) Consider an LTI system with impulse response CO5- Ana (16)

$$h[n]=\begin{cases} a^n & n\geq 0 \\ 0 & n<0 \end{cases}$$

and input

$$x[n]=\begin{cases} 1 & 0\leq n\leq N-1 \\ 0 & otherwise \end{cases}$$

Determine the output y[n] by explicitly evaluating the discrete convolution of x[n] and h[n].