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**Question Paper Code: 94403**

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2022

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)  $\frac{1}{2}$  (d) infinity
4. If the signal  $x(t) = \cos(2000\pi t)$  is sampled at 5000 Hz such that CO4- App  
 $x(n) = x(nT_s)$ , what is the fundamental frequency of  $x(n)$  in rad/sec?  
(a)  $2\pi/5$  (b)  $\pi$  (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  $\sin w_0 t$ . 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)

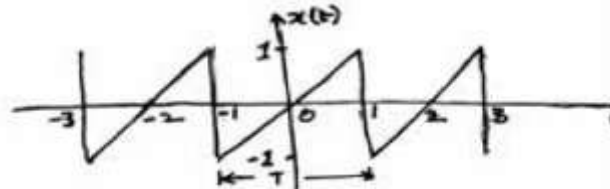
Or

- (b) Check all the system properties for the given CO2- App (16)

(i)  $y(n) = x(n + 1) - x(n - 1)$

(ii)  $\frac{dy(t)}{dt} + 5ty(t) = x(t)$

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  $\frac{d^2 y(t)}{dt^2} - 4 \frac{dy(t)}{dt} + 5y(t) = 5x(t)$ . 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  $x(t)=\text{SinC}(150\pi t)$  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 CO3- Ana (16)  
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.

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

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

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

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

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

