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Question Paper Code: U4409

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

Fourth Semester

Electronics and Communication Engineering

21UEC409–SIGNALS AND LINEAR SYSTEMS

(Regulations 2021)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 1 = 5 Marks)

1. For the signal, x(n)= log (cos(aπn+d))where a =50 Hz, What is the time period of the signal , if Periodic? CO1- U

   (a) 0.16s (b) 0.08s (c) 0.12s (d) 0.04s

2. Fourier transform of a Gaussian pulse is CO1- U

   (a) Another Gaussian pulse (b) Squared Sinc pulse

   (c) Sinc pulse (d) Impulse train

3. Given that F(s) is a one sided L.T. of f(t), the L.T. of $\int f(\tau)d\tau$is CO1- U

   (a) s F(s)-f(0) (b) 1/s F(s) (c) $\int f(\tau)d\tau$ (d) 1/s[F(s)-f(0)]

4. Sampled frequency less than Nyquist rate is called CO4-App

   (a) under sampling (b) over sampling (c) critical sampling (d) nyquist sampling

5. Z[u(-n)] is CO4-App

   (a) –z/(z-1) (b) 1/z-1 (c) 1/1-z (d) z/z-1

PART – B (5 x 3= 15 Marks)

6. A given system is characterized by the differential equation; Check the system for linearity and stability CO2-App

$$\frac{d^2y(t)}{dt^2} - \frac{dy(t)}{dt} - 2y(t) = x(t)$$

7. Find harmonics and TFS coefficients of the following signals. CO2-App

   $x(t)=10\cos^2(45t - 45^0)$

8. List and draw the basic elements for the block diagram representation of the CT systems. CO1-U

9. Determine the convolution sum of two sequences x(n) = {3, 2, 1, 2} and h(n) = {1, 2, 1, 2} CO4-App

10. State the advantages of Direct form II over Direct form I. CO4-App

PART – C (5 x 16= 80 Marks)

11. (a) Find whether the following signals are periodic, if periodic find the fundamental period CO2- App (16)

i) x[t] = sin 2t ii) $x(t) = e^{-3t}$ iii) 4cos5πt iv) x(n) =sin2πn+sin6πn

Or

(b) Check whether the given signals are energy or power signal. CO2- App (16)

i) x(t) = A cosωt, -T< t < T ii) $x(n) = (1/3)^n u(n)$

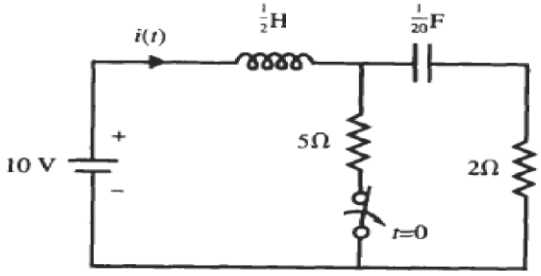
12. (a) Obtain the trigonometric Fourier series for the half wave rectified Sine function of 't'. CO3- App (16)

Or

(b) Consider a continuous-time LTI system described by $\frac{dy(t)}{dt} + 2y(t) = x(t)$ using the Fourier transform, find the output Response y(t) to each of the following input signals: CO3- App (16)

(i) $x(t) = \delta(t)$ (ii) $x(t) = e^{-t}u(t)$

13. (a) In the circuit shown below, the switch is in the closed position for a long time before it is opened at t=0. Find the inductor current i(t) for t ≥0. CO5- Ana (16)



a) Find the impulse response of the circuit using Laplace transform.

b) Analyze the performance of the circuit by comparing their stability, causality and linearity conditions.

Or

(b) Obtain the convolution of the given two signals using the convolution property of the Laplace transform and evaluate the results also with the conventional method of convolution. CO5- Ana (16)

$x(t) = e^{-3t} u(t)$ and $y(t) = e^{-2t} u(t)$

14. (a) i) Find the DTFT of x(n)={1,1,1,1,1,1,0,0}. CO4- App (16)

ii) Find the convolution of $x_1(n)$={1,2,0,1} , $x_2(n)$={2,2,1,1}

Or

(b) Find the DTFT of the given signal $x(n) = a^{|n|}$ and plot magnitude and phase spectrum. CO4- App (16)

15. (a) Realize the Direct form I, Direct Form II, cascade and parallel structure for the given difference equation. Comment on the results obtained. CO6- App (16)

y(n) - 7y(n-1) + 12y(n-2) =x(n)+2 x(n-1)

Or

(b) Realize the Direct form I, Direct Form II, cascade and parallel structure for the given difference equation. Comment on the results obtained. CO6- App (16)

y(n) - 7y(n-1) + 12y(n-2) =x(n)+2 x(n-1)