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Question Paper Code: 44404

B.E. / B.Tech. DEGREE EXAMINATION, APRIL 2019

Fourth Semester

Electronics and Communication Engineering

14UEC404- SIGNALS AND SYSTEM

(Regulation 2014)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

- Dirac delta function is also called as unit _____ function.
(a) Ramp (b) Impulse (c) Step (d) Signum
- A linear system should obey _____ theorem.
(a) Superposition (b) Hyper position
(c) Thevenin (d) linearity
- Fourier transform of Gaussian pulse will be
(a) another Gaussian pulse (b) squared sinc pulse
(c) sinc pulse (d) impulse train
- The frequency response usually represented in graph by its
(a) magnitude (b) phase
(c) both magnitude and phase (d) none of these
- The Laplace transform of $u(t)$ is
(a) $1/s$ (b) s^2 (c) $1/s^2$ (d) s
- Given that $H(s)=e^{-4s}$. What is the impulse response of the system?
(a) $\delta(t-4)$ (b) $u(t-4)$ (c) $e^{-4t}u(t)$ (d) $e^{4t}u(t)$
- The ROC can't contain
(a) any poles (b) any zeroes
(c) all poles (d) all zeroes

8. The Z transform of nu(n) is

(a) $\frac{z}{(z-1)^2}$ (b) $\frac{z}{(z-1)^3}$ (c) $\frac{z}{(z-1)^{-2}}$ (d) $\frac{z}{(z-1)^{-2}}$

9. Transfer function of LTI DT System also called as

- (a) System function (b) Impulse function
(c) Step function (d) Impulse response

10. The Z-transform of correlation of the sequence x(n) & y(n) is,

(a) $X^*(z)Y^*(Z^{-1})$ (b) $X(z)Y(z^{-1})$ (c) $X(z)*Y(z)$ (d) $X(z^{-1})Y(z^{-1})$

PART - B (5 x 2 = 10 Marks)

11. Find the odd and even components of the signal $x(t)=e^{-10t}$.

12. State Parseval theorem as applied for Fourier series.

13. Find the inverse Laplace transform of $X(s)=1/2[1/s + s/s^2+4]$

14. Define system function of the discrete time system.

15. State the time shifting property of the Z-transform.

PART - C (5 x 16 = 80 Marks)

16. (a) (i) Obtain the graphical representation for the following signals. (10)

(a) $x(t) = u(t)+u(t-1)+u(t-2)$

(b) $x[n]=\{1,2,5,2,-1\}$ plot $x[n]$, $x[3-n]$, $x[n-2]$

(ii) Test whether the following signal is periodic or not if periodic, calculate the fundamental period.

$$x[n]=3\cos\left[\frac{\pi}{3}n\right]\sin\left[\frac{\pi}{2}n\right]\cos\left[\frac{\pi}{4}n+\frac{\pi}{2}\right] \quad (6)$$

Or

(b) Determine whether the following systems are static , causal, Time invariant , Linear

(i) $y(n)=x(4n+1)$ (ii) $y(n)=x(n)+nx(n+1)$ (iii) $y(n)=\log_{10}x(n)$ v.) $y(n)=x^2(n)$ (16)

17. (a) Determine the trigonometric Fourier series representation for Half Wave Rectified signal. (16)



Or

- (b) The input and output of a causal LTI system are described by the differential equation: $d^2y(t)/dt^2 + 3 dy(t)/dt + 2y(t) = x(t)$.
- (i) Calculate the frequency response of the system
 - (ii) Calculate the impulse response of the system
 - (iii) Criticize the response of the system if $x(t) = te^{-t} u(t)$? (16)

18. (a) State and prove the

- (i) Initial value theorem
- (ii) Final value theorem of Laplace transform with the help of example. (16)

Or

(b) Estimate the inverse Laplace Transform of the following Equation

- (i) $X(s) = S^2 + 3S + 4/S^3 + 5S^2 + 7S + 3$. (8)
- (ii) $X(s) = S^2/S^4 + 4a^4$. (8)

19. (a) A continuous time sinusoidal signal $\cos(2\pi Ft + \theta)$ is sampled at a rate

$F_s = 1000\text{Hz}$. Determine the resulting signal samples, if the input signal frequency F is 400 Hz, 600Hz & 1000Hz respectively. (16)

Or

- (b) (i) State and Prove Convolution and Multiplication theorem using DTFT. (8)
- (ii) Obtain DTFT for the following DT sequence. $x(n) = (1/2)^{n-2} u(n-2)$. (8)

0. (a) Consider the following difference equation $y(n+2) - 5y(n+1) + 6y(n) = x(n+1) + 4x(n)$ with the initial conditions $y(0) = 1$; $y(1) = 2$. find the step response of the system.

(16)

Or

(b) (i) A LTI DT system has the state variable description

$$A = \begin{bmatrix} 2 & -1 \\ 1 & 0 \end{bmatrix} \quad B = \begin{bmatrix} 1 \\ 0 \end{bmatrix} \quad C = [3 \quad 1] \quad D = [2]$$

Determine the transfer function of state variable matrix. (10)

- (ii) State and prove initial and final value theorem of Z transform. (6)

